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NAVAL ARCHITECTS AND MARINE ENGINEERS

The fifteenth annual meeting of the Society for Naval Architects and Marine Engineers was held in Assembly Room No. 2, Engineering Societies building, 29 West Thirty-ninth street, New York, on Thursday and Friday, Nov. 21 and 22. The attendance at the first day's session was not as large as was anticipated, but before the meeting adjourned the usual number had put in an appearance. President F. T. Bowles presided. The report of Naval Constructor W. J. Baxter, secretary and treasurer, showed the society to be in excellent condition, although owing to numerous suspensions, the membership of the society is now 54 less than it was a year ago, having 801 members, as against 855 last year. During the year 44 new members were elected. The society has no liabilities and its present worth is $26,693.62.

The folowing deaths occurred during the year: Honorary member, C. H. Haswell; members, A. B. Canaga, G. H. Eimert, G. H. Kearney, C. H. Loring, T. E. Webb; associates, A. J. Cassatt, Eugene Griffin, Wm. L. Guillaudue, W. G. Shackford.

President Bowles appointed a committee consisting of Stevenson Taylor, Lewis Nixon, Col. E. A. Stevens, W. F. McFarland and W. J. Baxter to draft a suitable memorial in honor of the late Charles H. Haswell.

The following were elected members of the council: W. I. Babcock, W. F. Durand, F. L. DuBosque, M. G. Herreshoff, J. H. Linnard and W. A. Post. W. H. Brownson and A. D. Niblack were elected associate members of council.

The council re-elected Charles H. Cramp and Robley D. Evans as vice presidents for a term of six years, from Jan. 1, 1908. It also elected Jacob W. Miller as vice president to fill the vacancy caused by the death of the late Commodore Charles H. Loring. J. R. Andrews was elected an associate member of council to fill the vacancy caused by the transfer of Mr. Miller to vice presidency. Col. E. A. Stevens was transferred from life associate member to life member. The following new members were admitted:

FOR MEMBER.

Carlton B. Allen, chief engineer, marine department, N. Y., N. H. & H. R. R. Co., 30 Colonial place, New Rochelle, N. Y.

Ernest H. B. Anderson, technical representative, Parsons Marine Steam Turbine Co., 97 Cedar street, N. Y.

Ole G. Halvorsen, draftsman, engine department, N. Y. Ship Building Co., Camden, N. J.

Peter Cooper Hewitt, scientist, Madison Square Garden Tower, N. Y.

George M. Magruder, assistant superintending engineer, American-Hawaiian S. S. Co., 426 California street, San Francisco, Cal.

Lewis B. McBride, assistant naval constructor, U. S. navy, navy yard, New York.

Yoshihiko Mizutani, engineer captain, Japanese navy, navy yard, Kure, Japan.

Charles A. Parsons, director, Parsons Marine Steam Turbine Co., Wallsend-on-Tyne, England.

Robert S. Riley, general manager, American Ship Windlass Co., Providence, R. I.

James M. Smith, manager, Collingwood Ship Building Co., Collingwood, Canada.

Robert J. Walker, director, Parsons Marine Steam Turbine Co., turbinia works, Wallsend-on-Tyne, England.

Axel Welin, Hopetown house, Lloyds avenue, London, England.

Louis Williams, general superintendent, Superior Ship Building Co., Superior, Wis.

TRANSFER FROM ASSOCIATE TO MEMBER.

John A. Spilman, assistant naval constructor, U. S. navy, Bath, Me.

Allen D. Woods, marine engineer, Central Railroad of New Jersey, Jersey City, N. J.

TRANSFER FROM JUNIOR TO MEMBER.

Harold Lee, naval architect and engineer, Marion building, Seattle, Wash.

Harold W. Patterson, leading hull draftsman, Gas Engine & Power Co., and Chas. L. Seabury Co., Morris Heights, N. Y.

James G. Purdy, chief hull draftsman, Gas Engine & Power Co., and Chas. L. Seabury Co., Morris Heights, N. Y.

FOR ASSOCIATE.

Bentley Gardiner, member of firm, George W. Gardiner & Son, 15 William street, N. Y.

Holden C. Richardson, assistant naval constructor, U. S. navy, Newport News S. B. & D. D. Co., Newport News, Va.

Clayton M. Simmers, assistant naval constructor, U. S. navy, navy yard, Puget sound, Wash.

Henry A. Wise Wood, mechanical engineer, 1 Madison avenue, N. Y.

FOR JUNIOR.

Constantine D. Callahan, yacht designer, San Pedro, Cal.

Wayne T. Dimm, assistant chief draftsman, engineering estimating dept., Newport News S. B. & D. D. Co., Newport News, Va.

Dayton E. Herrick, draftsman, T. S. Marvel & Co., Newburgh, N. Y.

The banquet at Delmonico's on Friday evening was held in the main banquet hall and was unusually successful. In introducing the speaker of the evening, Hon. James T. McCleary, second assistant postmaster general, President Bowles said that it was high time the country realized that a merchant marine was a necessity to the naval fleet. Mr. Cleary's toast was "Our Merchant Marine." He explained that the second assistant postmaster general has exclusive charge of the transportation of mail on land and sea, and occupying that position he of necessity had made several pertinent observations. He thought that the best audience in the world to speak to was one that knew more about the subject than the speaker. His point was

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that an audience well versed in a subject is grateful for any additional light that may be thrown upon it, whereas an audience that does not know anything at all about a subject is not especially thankful for the mass of new matter submitted to them. He said that he was heart and soul in favor of the upbuilding of the American merchant marine, but that during the 14 years that he served in congress nothing whatever was accomplished. He thought the people in general understood that ships were needed and that they were envious that so magnificent a ship as the Mauretania should belong to another nation. He said that we buy 35 per cent of South America's export trade and sell it only 10 per cent. It was enough to make a man's heart sick in congress to see the shipping bill voted out year after year, many times by men who would be glad to vote for it but were withheld for party reasons.

He thought that the point to be emphasized in the upbuilding of the merchant marine by congressional enactment should be that of common defense. He thought the defense should be of the most effective type. The government is just sending an unsurpassed squadron of battleships to the Pacific coast, but he did not think that any American could feel proud of the fact that the colliers accompanying the fleet are foreign. He thought the country should consider the fact that if a state of war existed these colliers could not be secured at all, and persistently inquired who is wise enough to foretell war? Ten years ago we had no notion whatever of going to war, and yet war broke out with Spain and outrageous prices were paid for obsolete ships to act as transports. One way to obviate the present difficulty was to build a complete set of auxiliary ships at a cost of about $100,000,000, but that a better way would be to urge private capital to make the initial investment and receive a certain specific sum from the naval defense fund, the vessels to conform to certain rigid specifications of the department in case they should ever be needed as transports. This could be accomplished without taking one dollar out of the treasury if the government would simply devote the profits from sea postage to this end. The revenue from sea postage last year was $6,500,000 and the cost of the service $3,000,000, leaving a profit of $3,500,000, a sum ample to project an adequate auxiliary fleet of merchant ships. At the present time five-sixths of the money earned in sea postage goes to foreign ships because there are not sufficient American vessels to earn it. He thought that if the government would give to its own rather than to foreigners a considerable fleet of vessels would rapidly spring into existence. He emphasized the point, however, that nothing was to be hoped for if the object was to be commercial. Commerce is inseparably linked in the mind with an appropriation from congress when the idea exists that some person is to personally profit thereby; but common defense is altogether another matter and is something that appeals to the inherent sense of national integrity in all the people.

President Bowles declared Mr. McCleary's argument to be the soundest, most business-like and most simple that he had ever listened to and he wondered that no one had thought of it before.

Rear Admiral Goodrich in responding to the toast, "The Navy," made a plea for simplicity in battleship design. He thought a battleship should be stripped for action and should not have the multitude of incumbrances above deck that it now has. He would remove military masts, remove ventilators and take out a thousand things below deck that simply consume space and are a great bother to care for—in other words, to lead the simple naval life. He thought ideas should be openly discussed and pleaded for a homogeneous fleet of ships of the same size.

President Bowles remarked that if there were more sensible officers, not so many that desired that battleships should be replicas of the Astor hotel, a simple fighting machine might be evolved.

The society was fortunate in having as its guest G. B. Hunter, of the firm of Swan & Hunter, builders of the Mauretania. The Mauretania had arrived in New York but three or four hours before the banquet, and Mr. Hunter stated that the invitation to attend was of such a warm character that he would have been ungrateful and unappreciative if he had not accepted it. He regretted that the ship had not reached port on Thursday, as was anticipated, but the elements were against her. She had made the trip from the Tyne to Liverpool in such beautiful weather that there was hope it might cantinue all the way across. Moreover, the vessel having proved her extreme speed in her trials, the Cunard company had issued positive orders to Capt. Pritchard not to drive her. However, one day she did make a continuous speed of 25 knots for 24 hours, and he feared that probably Capt. Pritchard would be reprimanded by the company. He thought that the credit for the existence of the Mauretania belonged exclusively to the Cunard line, that there were builders both in the United States and Britain who could build her, but only one company to order.

He desired to say one work on the question of subsidy, and assured the society that instead of granting a subsidy the British government had really driven a very hard bargain with the Cunard line.

"I presume," he said simply, "that your government is a far more generous one." As the United States has done nothing for the merchant marine for the past 50 years this statement elicited unusual merriment. He said that the Mauretania and Lusitania were capable of being both armed and armored and were to be driven at great speed, and that the sum allowed the company by the government was very inadequate for the services exacted. He felt that the time would come when the United States would have a merchant marine worthy of its greatness and that Britain would certainly not be jealous of it if it is gained on equal terms and by the same means as Britain's has been gained. He spoke of the ship yards of the United States and expressed the utmost admiration for their completeness.

President Bowles, on behalf of the society, extended a cordial welcome to Mr. Hunter, and expressed the gratitude of the society to both builders and company for the creation of such magnificent vessels as the Mauretania and Lusitania.

Rear Admiral Sperry made a brief plea for aid to the merchant marine, but thought it should be along the lines of a limited investment in merchant ships and a decent sum for their maintenance on special duty. He deplored the use of the word subsidy.

R. P. Schwerin, vice president of the Pacific Mail Steamship Co., made a powerful speech, reviewing present conditions on the Pacific. He stated that the C. P. R. line, sailing from Vancouver, receives a subsidy that is sufficient to pay its operating expenses from Vancouver to Hong Kong and return. He referred to the material assistance that the Japanese lines are getting from their government, paying one company as much as $614,000 annually. On the other hand, the United States not only declines to help the vessels on the Pacific ocean but harasses them with onerous conditions and levies heavy fines upon them for perfectly ridiculous reasons. Concerning the suspension of the immigrant trade on the Pacific he very pointedly said that if the same condition should be enforced on the Atlantic the liners would go out of business, as they derive their main support from the carrying of steerage passengers. The Boston Steamship Co. is operating two vessels on the Pacific and the Boston Tow Boat Co. three, but so disastrous has the venture been that the tow boat company has abandoned its Pacific service and one of the three vessels is now on its way to the Atlantic ocean. He doubted very much whether the Pacific Mail Steamship Co. would renew its charter, which expires next April.

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"After 50 years of work trying to build up the American merchant marine," said he, "I am on the point of losing my job."

The concluding speaker was Lewis Nixon, who spoke briefly but hopefully.

Those present were Robert W. Bailey, Stedman Bent, Charles W. Buckelew, Emil A. Briner, Wm. Bailey Jr., Charles E. Burney, W. H. Bailey, H. E. Boucher, E. L. Boas, L. P. Brooks, Edward P. Bates, W. F. Carnes, Edwin S. Cramp, H. Capderielle, R. B. Clark, Jarvis B. Edson, Henry L. Ibsen, Robert Everett Hall, Gustav Hillman, H. T. Hayward, John B. Hoover, Frank Bowne Jones, Alfred J. Jupp, Parker H. Kemble, Frank B. King, Frank E. Kirby, Sidney G. Koon, Lewis H. Kenney, F. K. Lord, C. E. Littlefield, A. S. Lewis, George E. Lawrence, Walter S. Leland, J. M. Lincoln, A. E. Luders, E. A. Magee, J. F. Meigs, James C. McGuire, Thomas Mooney, George W. Magee, A. M. Merrill, John H. Macalpine, S. D. McComb, D. G. Moore, Commander A. Nebolsine, J. G. Purdy Jr., H. W. Patterson, Joseph S. Potter, Joseph S. Patterson, Eugene R. Pommer, James R. Raymond, G. Edward Smith, A. Cary Smith, Sinclair Stuart, E. B. Schock, W. P. Stephens, E. A. Stevens Jr., Stuart Farrar Smith, D. W. Taylor, H. H. Thayer Jr., Alfred A. Thresher, H. S. Taft, John D. Van Buren, T. E. Webb Jr., J. W. L. Water, Morris M. Whitaker, Chauncey G. Whiton, Frederick Meriam Wheeler, L. W. Walker, Frederick C. Whitehouse, George H. Waters, E. B. Barry, R. H. M. Robinson, W. G. Randle, Marston Niles, Charles D. Mower, Thomas I. Miller, Wm. McEntree, Wm. M. Finkenaur, N. F. Palmer, Wm. G. Groesbeck, H. DeSuyer, Carlo Pfeister, I. L. DuBosque, J. R. Andrews, H. L. Aldrich, H. C. Sadler, J. G. Winship and Stevenson Taylor.

The first paper read at the opening session was entitled "An Experimental Investigation of Stream Lines Around Ships' Models," by Naval Constructor D. W. Taylor. The introduction herewith will serve to define its character:

STREAM LINES AROUND SHIPS' MODELS.

"One of the investigations carried on at the United States experimental model basin during the past year has been into the question of stream lines or lines of flow around ships' models. These flow lines must be practically the same for ship and model, and a knowledge of them is important in determining the locations of bilge keels, docking keels, etc. Several different methods of investigation were tried, all, however, upon the same principle. The details of the method finally adopted as the best are due largely to Mr. E. P. Lesley, who was detailed on this work for some time. The surface of the wooden model is coated on one side with hot glue applied with a brush. Before this sets it is painted over with a strong solution in water of sesqui-chloride of iron (Fe_2Cl_6). It is allowed at least 24 hours to set and harden. The model is then put in the water and towed at the speed corresponding to that of the full-sized ship.

"To trace a stream line a small hole is bored through from inside or, in the case of extremities, from the opposite side of the deadwood, and a strong solution of pyrogallic acid [$C_6H_3(OH)_3$] is injected through the hole while the model is under way. A solution containing 10 ounces of acid to a gallon of water, which was about the strongest solution used, has a specific gravity of 1.03. This is instantly largely diluted by the water as it passes through the hole in the model, and flows aft as part of the water. The particles of pyrogallic acid which come in contact with the coating of chloride of iron combine to form ink, and the result is a dark streak or smudge on the surface of the model, which widens as it passes aft, and is of such a nature that its center line, which is taken as the stream line past the hole, can be located with a good deal of accuracy, say, within a quarter of an inch for a distance of from 2 to 4 ft. abaft the hole. After each run the model is lifted from the water, the stream line located as far as possible and marked, and a new hole bored at the after portion of it for the next run. The process is not a rapid one, even when several stream lines are being carried aft at once, and it takes about a day to determine half a dozen lines of flow from stem to stern of a good sized model.

"The wave profile against the side can be determined similarly by dropping a little acid into the water close to the side; but, since ripples cause the water to wet the side above the true mean surface, the wave profile thus determined is apt to be from ⅛ to ¼ of an inch above the true mean wave surface. The wave shape, however, is quite accurately given."

DISCUSSION.

Captain William Hovgaard: I have been interested to notice that the models where the greatest stern wave, the most pronounced stern wave, is found are those where the lines of flow, the lines of stream flow, are chiefly in vertical planes, also that the stern wave is considerably greater than one would have believed. Especially in Figs. 4 and 5 it will be seen that the stern wave is often greater than the fore wave. It would be interesting if Mr. Taylor would tell us his conclusions as to the best location of the bilge keel. Bilge keels are generally placed at the rounds of the bilges, and that is just where these diagrams seem to show that none of the stream lines which are in direct contact with the bow do flow. The stream lines seem, in fact, to prefer the shortest distances, the shortest cut, which, of course, is natural. The consequence is that there are no stream lines hardly to be found on the sketches given in the diagrams, and we must conclude that the water which flows off the bilges, in contact with the bilges, is water that has not been in direct contact with the bow of the ship. I think the usual practice is to place bilge keels in nearly diagonal plane, very often in line with the section of the central line plane. Now, it would be of interest to learn whether Mr. Taylor has arrived at any definite conclusion concerning location of the bilge keel. I think it would also have been interesting to have the lines of flow for the torpedo boat models, as torpedo boats are more difficult than other types of ships, as regards placing the bilge keel. I have seen one case where the bilge keels were placed very far forward in the torpedo boat, the idea being that the dead way would be better, when going ahead, and there would be better steering when going astern. The boat lost so much in speed that they had to change it back to the original place, in fact, the boat lost 1½ knots out of 22½, the reason being, no doubt, that the torpedo boat changed its position so much that the bilge keel offered a greater resistance to the propulsion of the boat.

M. S. Chase: I am very much interested in Mr. Taylor's method of arriving at these results, and would wish that some experiments had been made in the case of submarines. The question of bilge keels is a very important one, and I would like his opinion whether or not that subject should be investigated, and it seems to me the investigation of flow of stream lines would help us in determining a good many factors in regard to submarines, and certainly with regard to their stability of motion when running submerged, in regard to which we have very little information.

Prof. Sadler: I think this is certainly an epoch-making paper—so little has been known about stream lines flowing around vessels—that I think we must all welcome this paper, especially as it shows us that most of our former ideas on the subject have been wrong. I think two points in the paper must strike every one; the first must be the rapidity with which the surface particles reach the bottom of the ship, that is the particles at the water line seem to get around under the bottom in the case of the cruiser type of vessel, at about 25 to 30 per cent of the length. In the flatter type, or the merchant vessel, the particles at the surface seem to get under the bottom in about from 12 to 18 per cent. There is also, I think, rather an interesting point in connection with the broad and shallow types of vessel, as shown in Figs. 5 and 7, which represent in general the broad and somewhat shallow types, and we notice at the stern, in about sections 16 and 17, and on, that the flow is much more nearly horizontal than in the other types. In all other types of vessels the normal ratio of flow of water around the stern seems to be approximately the diagonal line, but in the broad and shallow types it approaches more nearly the horizontal line at the stern. I am sure that I think the thanks of the society are due Mr. Taylor for this very valuable paper.

W. P. Stephens: I think this paper is an important one in the series Mr. Taylor has given to us, and is an evidence of the value of the plant of which he has charge and the way in which he handles it. It seems to upset a good many preconceived theories as to where the water went which was displaced by the vessel. It might be that the water displaced at the surface would find the line of least resistance arising at the bow, and then the gravity would help it to fall again, but we are not prepared to find it going down directly under the bottom of the

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boat in the way that these diagrams indicate. I wish Mr. Taylor could have shown us the stream line of these vessels with very flat bottoms platted on the half breadth plans, so that we could see exactly the curious course of the water in and out of the keel, as it goes along. It would also be interesting to know something of the force of the water under the keel where the length of the bow represents 60 per cent of the total length, and length of line also, perhaps 60 per cent, where the water would come in the case of these boats. The stream line here seems to transfer water which is not near the surface immediately down to the vicinity of the keel, where it finds escape in the place nearest to the keel, and does not go around the bilge, as we always supposed it did as evidenced in the bilge keels.

I hope this is only the beginning of a series of experiments which, I believe, Mr. Taylor is more competent than any one else to show us, and that we may hear further from him on this subject.

A. A. Packard: Another interesting question comes up as to the co-efficient of friction. In line with what Prof. Sadler has said, evidently some of the water that touches the bilge must come from outside and not along the surface of the hull. That, of course, must increase the skin friction resistance, and any increase in skin friction resistance must, from what I imagine most of us have assumed before, have an apparent effect, because the stream lines are so much longer in these deep hulls—we find them up 40 per cent above the water line, and they go down under the hull and come up again. These long distances must increase the resistance, surface resistance, over plane surface, to a very marked degree. The question of bilge keel has come up very often in high-speed small boats, and we have given up putting them on entirely, and most of the small boats have a central keel which is good, and practically makes little difference in the resistance. We find almost no effect in putting a good sized keel on a high speed boat, as opposed to having none. We have two boats, one of which was shown in my paper a year ago, one of which is the Mercedes. We had about 4 in. of keel on the Mercedes, and she went 26 miles an hour, and we took the keel off, and could not find the slightest difference in the speed, she went just the same in either case.

Another interesting question which came to my mind is the effect of the propeller on these stream lines. Apparently, if the wave shape of the stern is horizontal, the stream lines underneath are about horizontal. This must add to the efficiency of the propeller. I would like to ask Mr. Taylor how much he supposes the efficiency of the propeller is increased when the flow is parallel to the shaft, instead of perhaps 15 degrees across it. In our high speed boats, we generally do get a difference with short pitch screws, which has a marked effect. With screws of a longer pitch we found very little difference, and I would like to know if any experiments have been made with propellers going through the water on an angle, as it might have some bearing on the question on what we have on the stern.

F. B. King: I merely want to draw attention in these sets of diagrams to their bearing on the value of any easy bilge in vessels of the shallower type of design. If any one looks at Fig. 3, the collier, and Fig. 5, the shallow draught river steamer, both of which have high bilges, he will see the great distortion of the stream lines which must occur in and about the stern. I would like also to ask Mr. Taylor whether he has made any investigations tending to show the difference of the stream lines at some distance from the surface of the hull, of course, these traces on the model are merely the water which is in actual contact with the skin of the ship, but if we are seeking the best design, the best position of bilge keels, it seems desirable to know something about the streams lying at a distance of perhaps 2 or 3 ft. from the skin of the ship.

W. Gatewood: The information presented by Mr. Taylor in this paper has been obtained in such a manner as to remove any doubt which might otherwise exist as to the accuracy of the lines of flow which are shown in the diagram. The influence of the shape of the entrance lines is very plainly marked. On the collier and ore carrier, which have "U" shaped sections forward, the water in contact with the hull for quite a distance below the surface moves off sidewise practically parallel with the free surface, while on the models with "V" shaped sections forward the water seems to be forced down under the bottom. On the models with a full load water line aft, the flow seems to approximate more closely to the buttock lines than on the models with a fine load water line aft where the flow is more nearly parallel to the free surface. The outboard flow of the water under the flat of the bottom, while entirely unexpected by me and, I presume, by the majority of the members of the society, is possibly due to one or more of the following causes:

(a) When a model travels a short distance through the water a virtual cavity is formed equal in volume to the area of the immersed midship section multiplied by the distance traveled. The wave profile in the after body should be used as the load water line in determining the area of the immersed section. This cavity can be considered as divided into a number of cells, which have a volume equal to the area of the body plan contained between adjacent transverse sections multiplied by the distance traveled by the model. The relative location of the center of volume of these cells, which can be taken as the center of the area contained between the sections in the body plan, must influence or determine the direction of the flow of the water adjacent to the hull. As the cell nearest the parallel middle body usually has its center of bottom at the bilge, the water under the volume must flow outboard toward the bilge, the region of least pressure, to help fill the virtual cavity.

The line adjoining the center of volume of these cells seems to correspond very closely to a line of flow as experimentally determined.

(b) The bottom of a flat bottom model, such as the collier and ore carrier, may be considered as an inclined plane, of limited extent transversely, when the model is under way, if the stern of the vessel settles more than the bow. The region of least pressure would, under such circumstances, be outboard, and the water would tend to escape from under the bottom by flowing toward the bilges. This explanation is hardly tenable, however, as I understand that in this class of vessel the stern usually settles less than the bow.

(c) If the model travels in a channel, the cross-section of which is of the same shape as the midship section of the model, only a trifle larger, the water in front of the model will experience an increase in pressure equal approximately to the pressure corresponding to the speed of the model. The water in the rear will experience a corresponding decrease in pressure. The water surface in front, therefore, will be raised and that behind will be lowered, the water in front being pushed ahead and the water behind being sucked along. If the gap between the model and the sides and bottom of the channel is small, the water under the bottom and on the sides forward below the level of the water surface aft will have a head to produce flow through the gap equal approximately to twice the head due to the speed of the model, and will attain a velocity through the gap greater than the surface water attains. The direction of flow through the gap, therefore, will be toward the surface and away from the keel line of the model. If the gap on the side of the model is wider than that under the bottom, it would

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seem that the outward flow under the bottom would be accentuated.

The conditions surounding the experiments described in the paper approximate to this latter condition, except that the gap is so great that the wave action dominates the other features.

Nothing is stated in the paper relative to the speed of flow along the stream lines. It is reasonable to suppose that the speed varies at different parts of the same stream line and that the speed along different stream lines also differ greatly. Some idea of the relative velocity of flow was probably obtained in the experiments on which the paper is based and information in connection with this view of the subject is desired from the author, in his reply to the discussion.

Some interesting data relative to the pressures at various points on the surface of the models can probably be obtained in the experimental basin by the use of the manometer used in connection with ventilation tests. If the author of the paper can arrange to conduct a few experiments along this line, I am sure the society will be pleased to have him read at the next meeting of the society a paper embodying the results.

D. W. Taylor: In reference to Capt. Hovgaard's remarks on the subject of the location of bilge keels, it is true that the diagrams do show rather a blank in the wake of the bilge, that the water which comes in contact with the forward portion of the ship apparently all goes under the ship, so that the water which comes in contact with the bilge proper is water which presses out from the bow, here outside beyond the influence of the hull, but we have in the case of several models made special experiments to trace the lines of flow in the vicinity of the bilge, and, of course, in the case of an actual model now we would always locate the bilge keel from such experiments, and in that way we would attain the same result as we do with the central keel. We know the central keel must be parallel to the line of flow, and it has been our experience, as well as we can judge from models, that the bilge keel which follows close to the line of the flow affords no extra resistance beyond its wetted surface, and it is sometimes hard to find an actual resistance equal to the wetted surface.

I should say with reference to Capt. Hovgaard's remarks, that the bilge keels which are now arranged in a diagonal plane, passing through the intersecton of the central vertical plane with the load water line, would in most cases, which cases differ a little from each other, but in most cases would be more nearly parallel to the lines of flow if the plane, instead of being a true diagonal, was cantered upward, so as to pass through or intersect the load water line some distance to the center, and out the center line some distance above the water line. Amidships the water follows a fairly straight course, so that the bilge keel can be located in one plane without serious interference with the lines of flow. I would ask with reference to the torpedo boats Capt. Hovgaard spoke of, whether the bilge keels which show such excessive resistance were located on a diagonal plane.

Mr. Hovgaard: As far as I remember, they were on diagonal planes.

Mr. Taylor: The probability is that if they were on a diagonal plane forward they were very much across the lines of flow, and there was probably a good deal of eddying behind the bilge.

In reference to Mr. Stephens' remarks, the diagrams are on a rather small scale, but if you will trace them out you will find, even in Fig. 6, the intersections of the various stream lines, that each section is given, so that it is not very difficult to reproduce the lines of the flow. Looking at that in the body plan, they seem rather hard and awkward at times, but that is because where the sections are nearly parallel they come close together, but looking on a full sized model you see they are fairly easy and seem to follow the line of least resistance. We have not made any experiments of this kind with high speed forms, such as gasoline boats, etc., which are outside of oun sphere so far.

No doubt, as Mr. Packard states, there is some increase of wetted surface resistance. That is generally recognized, but it is not altogether due to the increased length of the lines, I think. You must remember that forward and aft the water is retarded as it flows from the hull, and amidships is accelerated, so that the exact increase of wetted surface resistance, above that of the plane surface, is a very difficult matter to decide, and I do not think it has ever been satisfactorily determined. It is our practice to assume that the resistance is the same as the plane. Bearing on this point, the actual wetted surface is a good deal affected by the waves, and due to the fact, I suppose, when the ship begins to rise in the water, it also seems to pump the water away from it, so that there is a marked decrease in the actual wetted surface.

In reference to the question asked by Mr. Packard with reference to stream lines around the propeller, we have made no experiments on propellers, advancing an inclination, but there can be no doubt that such propellers are working under unfavorable conditions for efficiency, particularly propellers of fine pitch, because the slip angle under which the propeller works, even with a fairly high slip, is seldom as great as 10 degrees—I think 10 degrees slip angle would be quite abnormal—so if you have a propeller shaft inclined 15 degrees from the line of motion, it means during part of the revolution one blade of the propeller is working with a negative slip and another part with double the average slip, and that condition, it seems to me, cannot be favorable for efficiency. It also seems rather queer to see propellers inclined with such a large angle. In that connection, this work shows as the water is rising aft even a propeller shaft which is horizontal has a virtual inclination due to the fact that the water is rising.

With reference to Mr. King's remarks, I think this work shows the importance of an easy bilge, tolerably well forward, that is to say, about one-quarter the length of the ship. The water is trying hard to get under the bottom, and if you have a shape such that it is difficult to get around the sections, you have a ship that is harder to drive. Some of the analyses of models appear to indicate that at about the point where the water wants to go under the ship, you ought to have the sections put in very full, not over 85 per cent fullness of section.

We have made no experiments as regards the flow of water some distance from the hull, in regard to bilge keels, because I do not think there can be much difference. In the case of a ship with 70 or 80 feet bottom, at a point two feet out, there is probably very little difference in the general directions of line of flow, but we have made experiments in connection with the question of struts. To do that we rigged up a frame of silk mesh, with the meshes about a half inch square, extending well beyond the hull of the ship, so that the outer portion of the frame would have little or no effect upon the motion, and we coated that silk with the sesquichloride of iron and injected the pyrogallic acid a known distance ahead

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of it, and found where it showed on the mesh. The chloride of iron is very corrosive on the silk mesh, and the net has to be renewed every few experiments. The models which we tried that way, and for which we also had the stream line, seemed to show a close agreement, so that you could infer from the stream lines around the stern the general flow for some distance out, as far as you would put the strut ordinarily. The tendency appeared to be to follow very closely in parallel.

The President: The thanks of the society are due to Constructor Taylor for his ready compliance with our invitation to present this paper; and I am sure that the members all appreciate his having presented this valuable paper to us.

LONGITUDINAL DISTRIBUTION OF DISPLACEMENT UPON RESISTANCE.

The next paper was entitled "Some Experiments upon the Effect of Longitudinal Distribution of Displacement upon Resistance," by Prof. Herman C. Sadler, being the result of certain experiments conducted in the experimental tank at the University of Michigan at Ann Arbor.

DISCUSSION.

A. A. Packard: I think we owe a great deal to Prof. Sadler for discovering the fact that we can change the proportion of bow and stern, given length, and given bow, and we can get good results thereby. I take it as a true experiment in using the consonant in bow and stern. Prof. Sadler shows here apparently we can shorten the bow length in some cases, especially about the speed ratio of seven-tenths, and increase our parallel a little bit, with excellent results, making a cheaper ship to build and one which is more easily propelled. I think that is quite a great discovery, and an extremely interesting one.

D. W. Taylor: I think the society is to be congratulated that Prof. Sadler has kept up the good precedent established last year, and has given us again the results of actual experiments at his station, and I hope he will continue to do this for many years to come. I might say that at the Washington basin we have made some experiments, but very few, covering the field Prof. Sadler has covered, with a very poor co-efficient. The method we followed was substantially the same, except in most cases, instead of expanding the section horizontally, we expanded or diminished them in order to increase or decrease area, or shape the sections by it forward and aft. If we wished to get a given area at a given point, we chose the section which had that area. I did not think it was going to accomplish results Prof. Sadler had in mind, but in many cases we had to change the co-efficient, and we could not do that so well by simply expanding the sections. One feature I would like to draw attention to in the end of Prof. Sadler's paper, because it bears very much on something we have often noticed, and that is people who come to the model basin for the first time are very apt to attach great importance to the waves, and when we started out we made rather elaborate preparations to record the waves. You have to think, at first, if you have the wave against the side of the ship, you have something which is valuable, but as a matter of fact we found that we can draw very few inferences of value from that. It is of importance in many cases, but the true test is the curve of resistance. You will find in Fig. 6, I think it is about half way through the figure, is a diagram giving the wave profiles for the models with full bow and full stern, with fine bow and full stern, and with fine bow and fine stern. It comes just after the body plan. It would be very difficult to look at these three wave profiles, and say which model offered the least resistance. As a matter of fact, the curves show that the middle one, the No. 1 bow and No. 3 stern, offer one-half of the residuary resistance of the upper one, No. 3 bow and No. 3 stern, and yet I think you would be disposed to say from looking at the waves that the No. 1 bow and No. 3 stern really caused more waves. There is a difference forward, the typical wave accompanying the very full bow, the crest is centralized at the extreme forward portion. With the fine bow you have a system which reproduces itself more strongly, the second crest is stronger, and the first crest, instead of being at the extreme bow, is found a little distance back of the bow, that is typical of the fine water line forward, contrasted with the full water line forward, and considering the wave as a whole the middle wave is apparently stronger than the upper wave, and the same will apply to the lower wave. The upper figure apparently has less wave against the side than the other two, and as a matter of fact the residuary resistance was double almost that of the crest of the other two.

Capt. William Hovgaard: I think it is very fortunate that a tank has been established, which is at the service of any one who wishes to use it for the purposes of scientific research, and I think Prof. Sadler is to be congratulated on the good start he has made in the direction of such work.

Prof. Sadler: I have not very much to say in reply. What Mr. Taylor has mentioned is, of course, true, that all the transference of wave does not represent everything which goes on as far as wave making resistance is concerned. We have a camera installed, and I thought I should like to find if this transference wave system was really responsible for some of the wavy character of the resistance curve for the vessels with the fine end; that is, in other words, to see if the conclusion for the vessel where we keep the ends the same, and added metal to it, applied equally well to this, and that seemed to indicate that the transference wave system was responsible for the somewhat wavy character of the resistance curve. I may say we have another series of investigations under way, following out this, for the same type of investigation, for different types of vessels, and in some other commercial work we were doing last year, and on fuller types than this particular form we found practically the same thing happened so far as the wave-making resistance was concerned, that is, wherever possible, if we could fine up the ends even for a comparatively short distance we got a better result than keeping the ends full and letting the wave form gradually die away to the darker section.

At a recent session of the chamber of commerce of the port of New York a resolution was adopted which asked that Col. William L. Marshall, corps of engineers, United States army, be retained in charge of the Ambrose channel until it is finished. Much praise was bestowed upon Col. Marshall for having accomplished such a state of completion that the channel was navigable by vessels of the size of the Lusitania and the hope is expressed that as another half of the planned channel has yet to be excavated, probably requiring two years to complete, the distinguished officer will be allowed to go on and perfect the work, and that the government will, under no circumstances, divert his services from this work or allow anything to interfere with its prompt performance.

The three-masted schooner Francis V. Sawyer was launched at Millbridge, Me., Nov. 6. She is of 399 tons gross register and is owned by Sawyer Bros., of Jonesport.

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ATLANTIC COAST GOSSIP

Office of the MARINE REVIEW,
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New York City.

The Marconi wireless station at Siasconset was destroyed by fire on Nov. 15, the quarters of the operators and other small buildings, together with the engine house and a considerable amount of wireless apparatus, suffering considerable damage. The loss is estimated at between $6,000 and $7,000.

Prompt measures are being taken by the Marconi Co. to replace the apparatus and plant, the service being carried on, meanwhile, through South Wellfleet. The Siasconset station was the first to be established on this side of the Atlantic for commercial and ship news purposes.

The Kaiser Wilhelm II arrived at New York on Sunday, having encountered unusually heavy weather during the last three days of the voyage. In addition to her own passenger list, she also had a large number of passengers booked to sail on the Kaiser Wilhelm der Grosse, which should have sailed from Bremen, Nov. 12, the sailing day of the Kaiser Wilhelm II having been set ahead of the regular time in consequence.

The Kaiser Wilhelm II brought $8,000,000 in gold, principally consigned to New York bankers.

The departure of the Cunard steamship Mauretania from Liverpool on Saturday was the occasion of a send-off every bit as enthusiastic as that accorded to the Lusitania a few months ago, when the present record holder sailed on her maiden voyage. The Mauretania carries an unusually large number of passengers for this season, a total of 2,000, and is bringing a consignment of gold which is believed to be the largest ever transported on one vessel.

A home for German seamen is to be opened at Hudson street, Hoboken, on Nov. 23, under the auspices of the German Lutheran Association. A building has been secured near the piers of the North German Lloyd and Hamburg-American lines, being fitted out with reading, writing and meeting rooms. It is proposed to make the Deutsches Seemanshaus the headquarters of the German Seamen's Mission of New York, and in it will be the shipping office of the German Consulate.

Still another old warhorse gone to the bone yard. It is pointed out that the famous old Atalanta, one of the crack racers of 30 years ago, lies tied to a wharf at Boothbay Harbor, Me., her last resting place this side of the junk dealer's scrap heap. Built 34 years ago for William Waldorf Astor, the Atalanta has since had several owners, who used her for racing or cruising as they thought fit. Originally she was worth about $50,000, but is now worth about the price of the metal in her hull—$500. She was built at City Island, N. Y., in 1873, by David Carll.

The Crown Order of the third class has been conferred on Captain Polack, of the North German Lloyd, by the Emperor William, for steering the rudderless Kaiser Wilhelm der Grosse to Bremen.

The new steel tug Ontario was launched at the yard of John H. Dialogue, Camden, on Nov. 16, Mrs. H. B. Ward, wife of the constructor of the vessel, being sponsor.

The Ontario has been built for the Ontario & Western Railway Co., and will be used for towing in New York harbor and along the coast. She is 150 ft. in length, and will have triple-expansion engines.

The new tug Belhaven made a successful trial trip on Nov. 16. She was built for use on the Delaware river and bay by the Neafie & Levy Ship & Engine Building Co.

Consul General G. B. Ravndal, of Beirut, reports that inexcusable carelessness is manifested by American exporters in forwarding goods ordered by Syrian merchants, and says that explicit directions as to steamers are often disregarded. Goods that can be shipped to arrive at their destination in 30 days, are often shipped so as to consume three months in transit.

He also points to the fact that in numerous lines of goods American products stand an excellent chance of competing successfully in the Levant with European manufactures of the same character, provided American exporters pay sufficient attention to the matter of transportation facilities. Mr. Ravndal offers some good advice on the various methods of shipping freight, and calls attention to a 15-day American mail delivery.

The Old Colony, the new steamer built by the William Cramp Ship & Engine Building Co. for the Fall River line, successfully completed her standardization preliminary runs on Saturday, making a maximum of 21 knots, which is 2½ knots more than her contracted speed. The Old Colony is 400 ft. in length, 52 ft. beam, 14½ ft. deep, and is the first turbine vessel built on the Delaware river.

The towboat Owners' Association, of Philadelphia, at a meeting last week, decided to increase the rates for towing 20 per cent over existing figures. The increase goes into effect on Dec. 1 and applies to both the Delaware bay and river, and the Schuylkill river. The advance on the cost of operating the boats made the increase imperative, and the new rates, it is claimed, are practically those of 10 years ago.

The bark Adolph Obrig, from New York for San Francisco, is now over 220 days out, and her owners, Chapman & Co., are anxious about her. She passed Sandy Hook on April 10, with a general cargo.

Attention is called to the fact that the list of American sailing vessels that have tried, the most of them loaded with coal for the Pacific fleet, to get around the Horn and have entered the lists of the missing, or been totally lost, is a long one. It includes the Shenandoah, the old wooden bark Prussia, the Arthur Sewall, the Tillie E. Starbuck and several others. The reasons for these unprecedented losses, shipping experts say, are to be found not alone in the age of the vessels, but also in the incompetence of their crews through the dwindling of the number of able seamen.

The new British steamer Bisley, which arrived at New York last week, will load on the American-Rio Plata line for the Montevideo, Buenos Ayres and other ports in South America, being scheduled to sail Nov. 25.

The Bisley was built especially for this trade by C. Connell & Co., of Glasgow, and is of the following dimensions: Length, 400 ft.; beam, 52.2 ft.; depth of hold, 28.8 ft. She is fitted with triple-expansion engines, with cylinders of 26, 44 and 73 in. diameter by 48-in. stroke, and can steam about 12 knots fully loaded. She is expected to make the run to Montevideo in 23 days.

The Lackawanna, the latest addition to the Lackawanna Railroad's fleet in New York harbor, is now in service on the North river. The new ferry boat was built by the Newport News Ship Building Co., and proved her seaworthiness by coming round from the builders' yard to New York under her own steam.

The Buckeye Engine Co., Salem, O., has recently issued facsimile reproductions of a number of letters commending the Buckeye electric blue printing machine.

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UPBUILDING OUR SHIPPING.

Probably no man in the country is more competent to speak upon the need of upbuilding the American merchant marine than James G. McCleary, second assistant postmaster general. The second assistant postmaster general is in exclusive charge of the transportation of mail by rail and water, and is therefore cognizant of obstacles in the way of prompt delivery. At the annual banquet of the Society of Naval Architects and Marine Engineers held at Delmonico's on Friday evening last, Mr. McCleary was the principal speaker.

He had been a member of congress for 14 years and had during all that time worked earnestly in favor of measures of relief for the present condition of American shipping. He related that his congressional experience convinced him that efforts for relief were being projected in the wrong direction. He thought that all efforts to extend relief on commercial grounds should cease, owing to the fact that the average congressman cannot dissociate his mind from the thoughts of private gain when commerce alone is considered. He thought that the whole question should be approached from the standpoint of national defense only. The issue is pertinent as the navy department has just been compelled to charter 21 British colliers to accompany the battleship squadron from the Atlantic to the Pacific. This maneuver could not be made at all without the aid of these colliers, which of course in time of war would not be available. Mr. McCleary said that there were two ways of relieving this condition, one by building an auxiliary fleet of vessels by the government, the other by assisting private capital to maintain a fleet of auxiliary naval vessels by the payment of certain specified sums per annum. The latter he considered to be the correct way. Such a fleet would cost about $100,000,000 and would provide employment for thousands of men for a long time: Such a fleet could be maintained out of the profits of sea postage. Mr. McCleary pointed out that the earnings from sea postage are $3,500,000 per annum, a sum considered ample by the Merchant Marine Commission to project steamship lines to several quarters of the globe. The United States therefore has the opportunity to build up a fleet of merchant vessels without taking a single penny directly from the public treasury.

A mighty interesting speaker followed, G. B. Hunter, of the firm of Swan & Hunter, builders of the Mauretania, and what he said was quite pertinent to the present issue, though disclaiming vigorously that Britain subsidized her shipping. He considered that with the Cunard Line the British government had driven a very hard bargain, as the ships were of great speed, had numerous costly features not necessary in ordinary merchant vessels, were capable of being armed and armored, and were in fact auxiliary naval cruisers. He thought that the British government was not at all generous in its treatment of the Cunard company. It should be stated that the money to build these ships was provided in full by the British government at 2¾ per cent, accompanied by an increase in the general subsidy to the Cunard Line from $750,000 to $1,100,000. It will be seen that the increase in the subsidy is sufficient to pay for the interest on the loan, which is to be repaid in 20 years.

President Bowles expressed a common thought when he said that treatment similar to this was all that the American merchant marine required from its government. The American merchant marine would be willing to accept an extension of the ocean mail act of 1891 that would project lines to several South American ports. With such convincing testimony it is not readily understandable why aid is not extended by the American government.

The subject of shipping is one that the whole country is vitally interested in as witness of the following resolutions adopted by the Cincinnati Chamber of Commerce on Nov. 5 and endorsed by the Indianapolis board of trade:

Whereas, The industrial interests of Cincinnati, as well as other localities, are largely affected by transportation and mail facilities with foreign countries, incident to the great extent of export business in lines of manufactures and otherwise; and,

Whereas, The feature of time and of frequency in the transmission of communications upon which business interests are dependent is one of especial importance, so that whatever may serve to lessen the period of time necessary to consummate such communication by mail facilities has a direct bearing upon the industrial interests of our locality and of the country; therefore,

Be It Resolved, That to the end of securing facility for more frequent mail communication between the United States

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and South American ports, the rate of pay for ocean mail service now provided for ships of the first class, under the act of March 3, 1891, not to exceed $4 a mile, shall be applicable to ships of the second class, now allowed a rate of $2 a mile, which rate for ships of the second class has failed to induce the needful mail service from them; therefore,

Resolved, By the Cincinnati Chamber of Commerce that congress be urged to authorize the postmaster general at his discretion to apply to ships of the second class the same rate of mail pay provided for ships of the first class, when such allowance to second class ships will secure extension of mail facilities with South American and Oriental ports.

Resolved, That copies of this resolution be sent to the secretary of commerce and labor, to the postmaster general, to the secretary of state, and to each congressman from Ohio, and that said members of congress be and are hereby earnestly requested to use their best endeavors to secure the legislation suggested in these resolutions.

AROUND THE GREAT LAKES.

The steamer James B. Wood of the Gilchrist fleet has been ordered to lay up at Ashtabula.

It is reported that 23 vessels were at the Mesaba docks at Duluth on Sunday last waiting for ore cargoes.

One of the largest repair jobs of the year is that of the Ann Arbor No. 1 at the Milwaukee dry dock. Over two hundred men are employed in rebuilding the car ferry.

The Anchor Line has issued a preliminary announcement concerning the close of navigation and will not receive freight from Cleveland after Nov. 1 for upper lake ports.

The barge Regina, which followed the steamer Neepawah when she tore through the lock gates of the Lachine canal recently, is a total loss, together with her entire cargo of 25,000 bushels of wheat.

The minister of railways and canals at Ottawa has decided to transfer Supt. J. C. Boyd, in charge of the Canadian canal at the Sault, to take charge of the Williamsburg canal, with headquarters at Morrisburg. J. L. Ebreton Ross, the present overseer at Morrisburg, will take Mr. Boyd's place at the Sault.

The wrecked steamer Cormorant of the Hines Lumber Co.'s fleet, which burned to the water's edge and sank near Bass Island, about a month ago, has been raised and patched up by J. B. Wanless, who purchased the wreck, and taken to Bayfield, where her engines and boilers will be taken out. She will then be towed to Duluth.

It was announced at the Sault on Monday last that the first shovelful of earth for the new lock excavation will be turned this winter and that the work will be continued until the improvement is completed. A cofferdam will be constructed and several hundred feet of pier built before spring by the government, and it is expected that contracts will then be let for the completion of the job.

The temporary piles and falsework used in removing the wrecked draw span of the interstate bridge at Duluth, which was knocked out into the water by a vessel in August, 1906, have been removed from the north opening, so that now both the north and south draw openings are available. As there is further wrecking work in progress on the center pier, it will be necessary to keep a scow alongside which the contractor is using in connection with the work, and passing vessels are warned to be careful not to upset the little craft.

The former lake steamer A. G. Lindsay, which is on her way to Aberdeen, Wash., where she will engage in the lumber traffic, and which was twice reported lost since she left Cleveland last July, was heard from for the first time last Friday since she left Baltimore. The steamer is reported to have weathered all gales successfully, and that she was at no time in serious trouble, with the exception of one instance, when her machinery became disabled and she was tossed about in the storm severely before help reached her. It will take over a month to repair the steamer before she can proceed.

The bulk freight steamer John Dunn, Jr. building for the American Transit Co., by the Toledo Ship Building Co., was launched at Toledo on Tuesday of last week, and was christened by Mrs. Claude Smith, of Ithaca, N. Y. The John Dunn, Jr., is the largest vessel ever constructed at Toledo and is 524 ft. over all, 504 ft. keel, 56 ft. beam and 30 ft. deep. She has fifteen hatches spaced 24 ft. centers, and will carry 9,000 tons. Her engines will be quadruple-expansion with cylinders 20, 29, 42 and 61 in. diameters by 42 in. stroke, supplied with steam from Scotch boilers 12 ft. 6 in. by 12 ft., equipped with Ellis & Eaves draft and allowed 210 lbs. pressure.

MOTOR-DRIVEN LIFE BOATS.

The statement recently published in the newspapers that all the life saving stations in the country are to be supplied with motor-propelled life boats is not altogther correct. Some twenty stations are already supplied with such life boats, among which are nine on the lakes. It is the intention to install power into all large self-righting and self-bailing life boats in the service, but there are many stations, especially on the sea coasts, where such life boats are not available, and reliance is placed upon surf boats. It is not contemplated to install power into all of the surf boats, but the service is about to try the practicability of gasoline motors in some of them, not with a view, however, as has been stated in several newspapers, of dispensing with oars or of relying entirely upon motors in extremely dangerous surf.

The Intelligence Bureau of the navy department has compiled a statement showing the relative order of the warship tonnages of the principal naval powers which shows that Great Britain leads the world with a tonnage of 1,633,110, the United States taking second place with a tonnage of 611,616; France is third with a tonnage of 609,079; Germany fourth with a tonnage of 529,032, Japan fifth with a tonnage of 374,701 and Russia, Italy and Austria following in the order named. However, were the war vessels now under construction by the various powers to be calculated upon the United States would be only third in the list, with a tonnage of 771,758, closely following France with a tonnage of 836,112 and Great Britain, which leads with a tonnage of 1,821,610. All the others would remain in their same relative positions although for each there would be recorded a substantial increase.

The British battleship Superb, an improved Dreadnought, was launched at the Elswick yard, Newcastle, last week. The Superb is of 18,600 tons displacement, 490 ft. long, 82 ft. beam and draws 27 ft. of water. Her engines have an indicated horsepower of 23,000 and are expected to drive her at a speed of 21 knots. Her armament consists of ten 12-in guns in pairs, placed in five hooded barbettes, one in the forecastle, one aft, one abaft the funnels and one on each bow.

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NATIONAL BUSINESS MEN'S LEAGUE

Mr. W. I. Babcock Makes an Eloquent Plea on Behalf of the American Ship

At a meeting of the National Business Men's League, in session at the Auditorium Annex, Chicago, last week, at which 150 bank and railroad presidents and other executives were present, several addresses were delivered by men eminent in their professions touching upon the industrial and financial conditions of this country.

MR. W. I. BABCOCK.

Amongst these was an address by Leslie M. Shaw, former secretary of the treasury, in which he discussed the currency question, and Mr. Jacob M. Dickinson, general counsel of the Illinois Central railroad, spoke convincingly on the subject of "The Iron Horse."

Of especial interest to the shipping contingent, however, is the address of Mr. W. I. Babcock, the well-known naval architect, in which he discussed "Shipbuilding," touching especially upon its deplorable state in this country today.

Mr. Babcock's address was as follows:

It was in the early part of the present century that Ruskin, inspired by Turner's painting of the fighting Temeraire, said that "Man as a gregarious animal had never done anything finer than the building of a line-of-battle ship." Another great Englishman—a chief constructor of the British Admiralty—said forty years ago "The art of shipbuilding owes both its difficulty and its dignity to the fact that the comprehension of great scientific principles and the power of wisely arranging a multitude of minute details are alike essential to its complete mastery." And futher, "We all know that land architecture, the art of constructing edifices upon the fixed and solid earth, has absorbed a large measure of the thought and invention of the races of men and has been the means by which many splendid reputations have been worthily erected. But it may be permitted to us, who are engaged in the architecture of the sea, or the construction of edifices which shall stand upon and traverse the unsteady and yielding deep, to claim for our art both the greater difficulty and the greater honor, or, if this be denied, we may at least assure ourselves that we are engaged in an extremly arduous and honorable employment."

It is not my purpose, nor is this the time or place, to go into any description, technical or otherwise, of the actual processes employed in the design or building of a ship. Suffice it to say that the principles involved include everything that is comprised in the scientific construction of a great bridge or building together with a great mass of other facts and circumstances peculiar to itself. The completed ship may well be said to represent the sum of all human endeavor. In her design, construction and operation, every department of human knowledge is utilized and every industry of men is represented.

WHAT THE BUILDING OF A SHIP MEANS.

The raw materials from which a ship is built represent an exceedingly small percentage of her completed value. From the ore in the ground for the plates, the wood in the forrest for the decks and cabins, the cotton in the field for the sails, the hemp for the rigging, the wool on the sheep's back for the blankets in the cabin, all the tremendous increase of value represented in the completed ship when she starts out from the ship yard on her life's work is the result of labor. Thousands and hundreds of thousands of men in all sections of this great country contribute their labor to some part of the ship or its equipment, and thousands more are engaged in transporting the materials from one part of the country to another during the process of thier manufacture and final delivery to the ship yard. It would be difficult to name any single material known to the world to-day which is not contained in some part of a ship, its equipment or its furnishings, and equally difficult to name any trade or handiwork or process of manufacture which has not been necessary and indespensable in the preparation of those materials for making up the complex structure of the completed vessel.

Evidently, therefore, every man, woman and child, in this whole broad country is interested, directly or indirectly, in the ships of the country, and benefited by their construction. Shipbuilding is by no means a local industry but its ramifications extend everywhere and into every city, town and village in the land in one way or another. At every step in its construction the ship pays a tribute to labor and in no way can the languishing industry of the country be more quickly revivified than in a profusion of orders for ships. How absolutely im-

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portant therefore it is that a nation should be self contained in shipbuilding and in shipping.

Command of the sea is the root of the industrial growth of England, and latterly also of Germany. Not naval power alone but the commercial command of extensive shipping gives a solid foundation for industrial expansion at home and abroad. In 1651 England's position upon the seas was almost precisely like ours is now. The Dutch were then the world's leading maritime nation. They were a great free trading nation. England, realizing that its growth depended upon ships, detirmined to dispute the supremacy of the Dutch by adopting a policy that was the very antithesis of that pursued by its rival. It adopted the most drastic form of protective policy ever conceived and enforced it under the iron rule of Oliver Cromwell, continuing so without change for full two hundred years. Under penalty of forfeiture foreign ships were prohibited from bringing cargoes into Great Britain from any port in the world save the continent of Europe; and double alien duties were imposed upon imports into Great Britain coming in foreign vessels from the continent of Europe. The result of this policy, rigorously, continuously and unalterably applied, was the destruction of Dutch maritime supremacy. Nor did Great Britain rest its case there, for by direct subsidies, mail subventions and naval retainers it has steadily aided its ship owners in the projection of steamship lines to every part of the inhabited globe.

DISCRIMINATING AGAINST COLONIAL-BUILT SHIPS.

One of the contributing causes of the American Revolution was England's discrimination against colonial-built ships in favor of home-built ships, but the successful close of the war left the colonies in no better shape than they were in the beginning. Three-quarters of our imports and exports were carried by foreign vessels. As they were flooding the country with foreign manufactures and consequently draining it of specie for their payment, it was necessary that a drastic maritime policy be adopted for the protection of shipping. Accordingly the first great act of the first great congress was a tariff law passed on July 4, 1789, embodying among its provisons one for the protection of American shipping by reducing the duty 10 per cent on imports in American vessels and by making the tax on the tonnage of American vessels 6 cents while exacting 50 cents a ton from foreign ships. The duties on teas were doubled, in some cases trebled, when imported in foreign vessels. So completely did this law operate that not a single pound of tea was imported that did not come in an American bottom. Our shipping in the foreign trade doubled, quadrupled, and then doubled again. National ingenuity supplemented legislation, evolving the clipper ship, a thing of beauty combining high speed with great carrying capacity and with every possible labor contrivance. These matchless vessels carried 92 per cent of our foreign commerce and showed our flag in every port of the world. At that time our tonnage engaged in foreign trade amounted to 2,642,628 tons, being only surpassed by Great Britain, and more than that of all other nations combined. Our shipping gave strength, wealth, prestige and power to the country. Notwithstanding the ravages of the war of 1812, our protective laws made shipping so prosperous that new construction more than overcame the wastage, and our fine ships swept everything before them. It was that same wise congress also which passed the law denying American register to foreign-built vessels.

AMERICAN SHIP NEGLECTED FOR FIFTY YEARS.

It is now practically fifty years since protection has been withdrawn from the American ship, with the result that our foreign tonnage has dwindled to 923,466 tons, and there is not today building in the whole United States a single ship for foreign trade, nor has there been one built for the past four years. Consider these figures. In 1825 our foreign commerce amounted to $195,875,463, of which $180,702,261 was carried in American ships or 92.3 per cent of it. In 1906 our foreign commerce amounted to $2,690,014,559 of which $2,367,677,354 was carried in foreign ships, or 88 per cent of it. Why should these conditions continue when the remedy for it lies in our own hands?

It is usual to attribute this change from our once proud estate to the supremacy of Great Britain in metal ship building, but this is an error. British supremacy is not a cause, but an effect, the effect of several causes, namely, the destruction of our merchant marine by the civil war, the introduction of the iron ship, but most important of all the withdrawal of protection from the American ship coincident with the support and encouragement given to her ship building and shipping by the British government.

In the decade between 1830 and 1840 Great Britain inaugurated the policy of subsidizing her mail steamships and this policy she has pursued without interruption until the present time. In fact never has she been more generous than now. In the past seventy years she has expended more than $300,000,000 in mail subsidies and subventions to naval reserve steamships and by this consistent policy has interlaced the seven seas with commercial lanes leading to all quarters of the globe. The war of the rebellion practically wiped out our own commercial fleet, then composed almost entirely of wooden vessels, both steam and sail. Eight hundred thousand tons were sold to our government, of which nearly half was destroyed by confederate privateers let loose from English yards, and most of the remainder were transferred to foreign flags and put under foreign management in order to avoid capture. By the time the war ended the business of owning and operating ships in these United States had practically ceased to exist.

DEVELOPMENT OF THE IRON SHIP.

During this time the iron ship had been rapidly developed and steam had been introduced. Great Britain was quick to recognize the potential advantages of steam, the potential tonnage of a steamer being reckoned as two and a half times that of a sailing vessel of equal size, owing to rapidity and certainty of delivery. She developed the steamer by constant patronage wisely administered. England's coal and iron lying in contiguous hills, her iron industry was in full swing while ours was practically undeveloped. She began the building of iron steamships, the swiftest messengers of trade, the best and heaviest freighters. The wooden ship was rapidly driven off the face of the waters, unable to compete in the struggle for existence. Conditions of ship building had changed completely. The great forests of America, growing down to the very edge of salt waters, no longer gave us the advantage of the material. Not only the hulls, but the engines and boilers could be built far cheaper in England than in the United States. Well indeed did England improve her opportunity. There was no demand for new ships here, for the people who had owned and operated ships here had gone out of business or their companies had been disorganized and broken up by the war, and the English, and a few other nations to a less extent, had, under their neutral flags, secured such monopoly that no one in the United States under the conditions prevailing was disposed to contest it with them.

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The opportunity to absorb the carrying trade of the world was open to that nation which would aid the enterprise of its people by favoring laws. The British government adopted a policy of national aid and the timidity of capital quickly vanished. It is not too much to say that the principal ship yards in Great Britain have been built and equipped and their working organizations trained at the public's expense. For twenty years a very large proportion—about three-quarters of the warships of England, were given to private ship builders to construct, and for that work prices were paid not only large enough to show a handsome profit on the ships themselves, but to enable the builders to greatly enlarge their plants and organizations. And this policy still continues.

The coal and iron mines of England were in the north. To lessen the cost of transportation of manufactures, it was essential that the ships be built there also. Therefore at a tremendous expense, paid by the government, an insignificant stream flowing close to the northern mines was widened and deepened for many miles, and on the banks of the river Clyde are now the greatest and most famous ship yards of the world.

ENGLAND'S BOLD POLICY.

There is something magnificent about the boldness and generosity with which England has aided her trade of shipping. She has adhered steadily to that one policy, giving within the past three years a most illustrious instance of its efficacy. The Cunard line has just built with $13,000,000 of government funds, loaned for twenty years at 2¾ per cent, the giant turbine liners Lusitania and Mauretania, which have already captured the world's record for sustained speed. At the same time the Cunard subsidy was increased from $750,000 to $1,100,000 per annum, the increase in the subsidy alone being sufficient to pay the interest on the loan. These two ships are the fruits of national aid. They would not have been built without it.

During the almost half a century since the revolution in ship building took place, what has been the situation and condition of the American ship builder? Driven from the sea by the causes I have stated, the capital which had been invested in ships turned to the interior where the mighty impulse given by the war to all classes of manufacture and internal improvements raised to an unprecedented height both the rates of interest and the profit on investment, and there the capital still remains. Nothing was done for many years by the government at Washington for either the ship builders or the ship owners. On the contrary, by oppressive taxes, by the policy of building the ships of the government in navy yards exclusively, by extending the fiscal policy of protection to everything that entered into the construction of a ship, but denying it to the completed ship itself, the government in direct opposition to the policy of Great Britain, seems to be doing its best to kill the industry. The American ship was compelled by law to carry the mails for the postage alone, while at the same time the railroads and other land lines were liberally paid. As a matter of fact the railways during the past seven years have received from the general government $338,000,000 for railway postage, to say nothing of $70,000,000 expended by the government for railway mail cars. In all this time but one thing has been done for the American ship, and that was the passage of the Ocean Mail Act in 1891, granting a small mail subsidy.

TWO ACTS HAVE KEPT THE AMERICAN MERCHANT MARINE ALIVE.

What in all these years has kept the American merchant marine alive? Two things: First, the act passed by the first congress denying American register to foreign-built ships; second, the act of 1817 denying to foreign vessels any participation in our domestic or coastwise carrying trade—an act which for more than half a century foreign ship owners and foreign ship builders have denounced as barbarous, antiquated, ancient and archaic, but nevertheless under which the largest and most prosperous domestic fleet in existence has been created. The domestic trade of the United States employs vessels of 5,735,483 tons, making the total volume of our tonnage second only to that of Great Britain.

If beneficent laws can do this for our domestic trade, why cannot they do it for our foreign trade? They can.

Three years ago President Roosevelt appointed a Merchant Marine Commission which made a tour of the Atlantic, Pacific and great lakes ports for the purpose of making an inquiry into the state of American shipping. The result of that tour is to be found in three very interesting volumes of testimony and the direct outcome of it was the passage by the United States senate on Feb. 14, 1906, of a bill extending aid to our over-sea fleet. This bill created a naval reserve out of officers and men employed in the merchant marine and fisheries of the United States who were citizens by birth or naturalization. They were to be enrolled for four years, to be subject to call in time of war, and to be paid a definite sum of money in consideration thereof. Their number was not to exceed 10,000. The bill also granted a subsidy to cargo carriers based upon tonnage and provided for the projection of mail steamship lines to Central and South America, South Africa, China, Japan and Australia, thirteen distinct lines in all. The bill also provided a rebate of a proportion of the tonnage dues of such vessels as carried American boys as apprentices. This bill remained unacted upon by the committee on merchant marine of the house of representatives, and accordingly was not passed by the house at the first session of the last congress. Had it then passed, as no existing vessel could take advantage of its mail provisions, orders would have been immediately placed with American ship builders for seventy-five new American steamships. Consider what that would have meant to the general industry of the nation, and especially to labor, since 95 per cent of the cost of the finished ship must return to labor. The bill was taken up in the house towards the close of the short session of the last congress. The cargo carrying provision was eliminated and the mail lines reduced to four—two from the Atlantic coast to Brazil and Argentina, respectively, one from the Pacific coast to Peru and Chili, and one from the Gulf of Mexico to Brazil. In this form it was passed by the house and constituted practically no more than an extension of the Ocean Mail Act of 1891. Little as it was, it was better than nothing at all, for it would have meant the construction of a few new ships and would at least have pointed the way to the opening of new fields for American manufactures in South America. The senate was willing to accept the bill as amended by the house had it been permitted to do so, but it was defeated by the filibustering of Senator Carmack, who prevented it from being brought to a vote by talking it to death in the closing hours of the session under the rules of the senate which permit unlimited debate. There is probably some grain of comfort in the fact that the opponents of aid to American shipping have to resort to the questionable practice of filibustering in order to defeat a measure. There is no doubt in my mind but that if the sense of the country could be got at it would be found to be earnestly de-

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sirous of relieving the country from the embarrassing, undignified, and dangerous position which it occupies in relation to ships. The situation is really an uncomfortable one. In case of conflict, say between England and Germany, it would be practically impossible for us to take care of our foreign trade, and as we must depend upon the marketing of our surplus abroad in order to keep our factories at their full output, any disturbance of over-sea transportation would inevitably result in the stagnation of industry at home. A maritime country —and the United States is certainly a maritime country, since it has the largest navigable coast line in the world—should be self-contained in its shipping and ship building. The United States is not. It is the opinion even of economists that a nation should carry one-half of its foreign trade. We are therefore entitled to 50 per cent and we have but 12.

DEPLORE FAILURE OF SHIPPING BILL.

I deplore the failure of the shipping bill not alone on commercial grounds, but for patriotic reasons. The merchant marine is the cradle of the navy. There is no way of getting competent men to man our battleships except from the merchant marine. The constant complaint of the navy department is that it cannot get men to man its ships. The government can build them out of its inexhaustible resources, for that is simply a matter of money; but the matter of men is another question. Being a maritime nation we should not permit the sea habit to die out of our people. I believe in the creation of an adequate naval reserve among the men of our merchant marine service. The day will come when we will need them. There is no doubt in my mind but that the overwhelming disaster which overtook the Russian fleet in its contest with Japan was due to the fact that the ships were practically handled by landsmen. No nation with an over-sea commerce can afford to neglect its ships. Whatever handicaps there are to their successful operation should be removed. We may as well look facts in the face. The handicap to the successful operation of the American ship is the protective tariff. Secretary Root in his great speech before the trans-Mississippi commercial congress courageously declared that the American ship was suffering from an artificial handicap and that it should be removed by artificial means. What he meant by that was that the tariff had made it impossible to construct a ship in the United States as cheaply as it can be constructed abroad, and that this condition, created by the government, should be compensated by the government.

COASTWISE LAW IN DANGER.

Eternal vigilance is the price of liberty. It is as well the price of everything worth holding. Certain events of late have cast ominous shadows before them. The bulwark of the American merchant marine today is its coastwise laws, and yet at this very minute twenty-one British steamers are on their way from Glasgow to carry coal from Norfolk, Va., to San Francisco, Cal., for the use of the American navy. Attorney General Bonaparte has held that this is not an evasion of the coastwise laws. The fact remains that foreign ships are carrying American coal from one American port to another American port. The fact remains also that they have been chartered by the navy department to carry this coal because they can carry it cheaper than American ships. Why should they not carry it cheaper? The ships cost less to build and are costing less to operate. These are the two things that influence the freight rate. The navy department has done a thing that no American citizen would be permitted to do, and it has been upheld by the attorney general of the United States. The attorney general's opinion, however, is most vigorously assailed by counsel probably as eminent, and for my part I cannot understand why laws which have been held inviolate for ninety years should now be violated with the sanction of the general government, unless it is the forerunner of a general raid upon the integrity of these laws. In my opinion the coastwise law of the United States is in danger and it behooves American ship builders to organize to prevent any further encroachment upon it.

PROTECTION ON THE LAKES.

Here on the lakes nature has given us an additional protection for which we cannot be too thankful—the falls of Niagara and the rapids of the St. Lawrence—and these with the navigation laws have kept out of our waters the hungry British tramp steamers and allowed us to build for ourselves a mercantile fleet which, in its adaptability to the business and suitability to the trade which it carries on, is second to none in the world.

The cost of transporting a ton of freight a mile by rail in this country averages about 7¼ mills. By water on the great lakes it is only .92 of a mill, or about one-eighth as much. By the present Erie canal it is nearly two mills and on the lower Mississippi one mill. Yet notwithstanding these figures, the uncertainty of navigation on the Mississippi, from St. Louis down, is so great that the amount of tonnage engaged has steadily decreased from 2,000,000 in 1880 to only about 600,000 at the present time. Hundreds of millions of dollars would be saved by the substitution of water transportation between the central west and the seashore. Practical railroad men declare that the further lowering of railroad rates is impracticable. During the last decade, the internal commerce of the United States has increased 100 per cent, while the facilities of the railroads have increased only 25 per cent and are now practically at a standstill. Mr. Hill has declared that the cost of constructing railroads to meet the immediate requirements of the country would be five thousand millions, and this takes no account of the future.

Consideration of these matters has resulted in the present movement for a great inland waterway system from the lakes to the gulf and for the enlargement of the Erie canal on which the state of New York is now spending $100,000,000. The internal commerce of the country is secure. Whether the seaboard is reached on the Gulf or Atlantic, through Chicago or through Buffalo, the first part of the journey must be through the great lakes, and the tonnage seeking transportation over these inland seas is increasing by leaps and bounds. From the iron ranges of Michigan and Minnesota, 41,000,000 tons of ore will come down this year to the furnaces of the lower lakes. From the rich prairies of the great northwest, a golden flood of 200,000,000 bushels of grain pours over these waters to the east. In the opposite direction, from the mines in Ohio and Pennsylvania, 20,000,000 tons of coal is carried northward and westward for fuel.

GROWTH OF LAKE COMMERCE.

Twenty years ago when I first came to the lake country for the season of 1887 there was only 8,000,000 tons of ore, 3,000,000 tons of coal and 50,000,000 bushels of grain transported. For that year the total lake fleet comprised 727,234 tons, all except forty-two being of wood, and only three of the bulk freighters reaching a gross tonnage of 2,500. The total movement of freight on the lakes for that year was 5,494,649 tons. The total movement last year was 63,808,571 tons and for this season will doubt-

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less reach 75,000,000 tons. The tonnage passing through the Sault canal in seven months of the season of navigation is now three times that going through the Suez canal in the whole year. The tonnage passing Detroit in a year is more than twice the tonnage of London and Liverpool combined. The total tonnage of the lake fleet now reaches 2,183,833 tons, while the average carrying capacity of the bulk freight fleet is 5,000 tons. In twenty years the fleet has nearly tripled in total tonnage and the average size has nearly doubled. In 1887 I built at Buffalo the then largest ship on fresh water—a monster 345 ft. over all. In 1895 the 400 ft. mark was reached, in 1900 the first 500-footer was constructed, and last year in your own city of Chicago there was built the first ship 600 ft. in length, of which there are now fifteen in service and several more building—the vessels carrying 11,000 gross tons of cargo at a cost not exceeding four-tenths of a mill per mile, operated by a crew of less than twenty-five men, loaded and unloaded in four or five hours and making a round trip every eight days with the regularity of a passenger train. On one of these ships an ounce of coal moves a ton of cargo nearly three miles in fifteen minutes. The steamer A. B. Wolvin received a cargo of 10,250 tons of ore in ninety minutes and discharged it in four hours and ten minutes, a performance that it is probably safe to say cannot be achieved on any other body of water in the world. The development of lake trade with the coincident evolution of the ship, the loading dock with its ore pockets and the receiving dock with their great unloading machines and self-filling buckets, impress me as the world's greatest industrial romance. Witness the ore-laden fleet as it passes out of Duluth harbor; follow it a little down the lake until it joins the squadron emerging from Two Harbors to be joined by a third defiling from Ashland. Eastward they sweep, uniting with the old guard at Marquette, bearing down upon the Sault in a mighty throng, staggering the imagination to believe that they are plying water that knew only the birch bark canoe scarcely half a century ago. Ask what genii is it that has rubbed Aladdin's lamp to such purpose, and the answer is Iron. Onward they sweep and debouching into Lake Huron join another detachment coming through the Straits of Mackinaw from Lake Michigan. Down Lake Huron they continue, a vast and ever-growing procession, closing in at Port Huron for the passage of the Straits. Then the great parade, moving steadily onward, enters the Detroit river. It is no state occasion that one beholds, but the common business of the day. Never-ending, never-stopping, like shuttlecocks in some great machine they ply, making up the most impressive commercial panorama that the earth can show. Seventy million tons are passing in review, 40,000,000 of it being iron ore to be worked up by countless hands to do service to mankind in innumerable ways.

These ships have been made possible by the deepening of the harbors and connecting channels of the lakes, and the building of new locks at the Sault canal. Yet the total expenditures of the government on the lakes in the improvement of rivers and harbors this side of Niagara from the beginning have only been $88,000,000. Much more than that is saved every year in the cost of transportation compared to what it would cost if moved by rail.

GREAT SAVING TO THE PEOPLE.

General Alexander Mackenzie, chief of engineers, in his annual report, just out, says:

"The lakes must be properly considered the right of way, under government ownership, of the great transportation system. The private investment in American vessels is upward of $125,000,000, and in terminal docks and facilities many millions more. This waterway permitted the movement of freight last year aggregating over 63,000,000 tons, at a cost of one-third rail rates, netting the nation in dividends, or savings, over $100,000,000 in the past year, which yearly saving is in excess of the nation's total investment in exploring and improving the right-of-way. The large commercial interest involved and the profitableness of waterways to the nation, and their great area and length of trackage, warrant a full engineering organization to explore, improve and maintain them."

Even now we cannot load to 20 ft. draught through the Sault canal or the Detroit river, and the size of ships which is directly dependent upon the available draught, has therefore about reached its maximum. Increase in the available draught to 25 ft., according to figures prepared by Lieut. Col. Charles E. L. B. Davis, government engineer, with headquarters at Detroit, would cost $26,000,000 and years to carry out, but there is no doubt that it would be money well spent. With it would come a large increase in the width and depth of later ships and in carrying capacity, though not much more in length.

The conditions which have to be met in the operation of lake ships are peculiar and nobly has the ship builder risen to the requirements and met the necessities of the service. Nowhere else in the world can there be found a fleet of vessels so perfectly suited to the business, or carrying it on more economically or with less proportionate damage or disaster, while the large amount of tonnage built and the resulting standardization possible in the yards has brought the cost of building down to a very low figure. I am not one of those, however, who believe in a ship canal from the lakes to the ocean, either through New York state or down the Mississippi. A ship is built to do her work in open water and, except for very short distances, can not be made to operate profitably at the low speeds necessary in a canal or with the delays incurred in passing locks.

The lake ship is not strong enough to operate on the long seas of the ocean, her hatches are too many and too big and her deck fittings too light. Conversely the ocean ship is not fitted for the lakes and could not compete with the vessels now in the service here. There is no compromise possible between the two types.

On Nov. 1, the postmaster general executed contracts with the American Mail Steamship Co., for the transportation of mails between Boston and Philadelphia, and other ports of the United States, to Jamaica, for a period of ten years from July 1, next. On the same date contracts were also closed with the New York & Cuba Mail Steamship Co. for carrying the mails between New York and Havana. The American Mail Steamship Co. will receive compensation for its service at the rate of 66 2-3 cents per mile while the New York & Cuba Mail Steamship Co. will be paid at the rate of $1 a mile. The contracts were made under the mail subsidy act of 1881 and the companies will be required to transport the mails in vessels the specifications for which have been prepared by the navy department, their ships also becoming a part of the reserve force of the navy.

The Moran Co., Seattle, Wash., has launched the steel trawler building by it for the Chlopek Fish Co. This vessel quite resembles the Tyee, built by the same company recently, and it is expected to have her in commission by the first of the year.

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QUESTIONS FOR WHEELSMEN AND WATCHMEN.

273. What is a lighthouse book?

274. How many lighthouse books are there?

275. What do they contain and what are they for?

276. Where do you get them and who are they for?

277. What are Notices to Mariners and what are they for?

278. How do you get them?

279. What are they for?

280. As a usual thing what direction does the top of a chart indicate?

281. What direction does the bottom of a chart indicate?

282. What directions do the sides of a chart stand for?

283. What is the chart for?

284. The wind is NE and you are steering SSW, when you hear a schooner's fog horn of one blast on your starboard bow and at the same time you hear two blasts of another schooner's fog horn on your port bow; what would you do? What tack is each vessel on, and about how are they steering, and how will they go clear of each other?

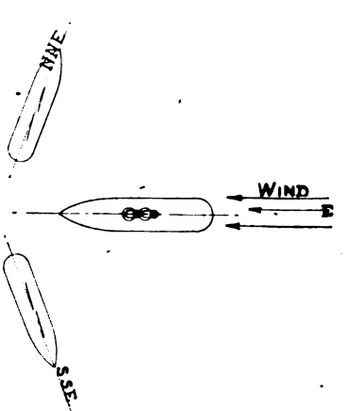
ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

TWENTY-SECOND INSTALLMENT. PUBLISHED NOV. 14.

248. Port helm and go astern.

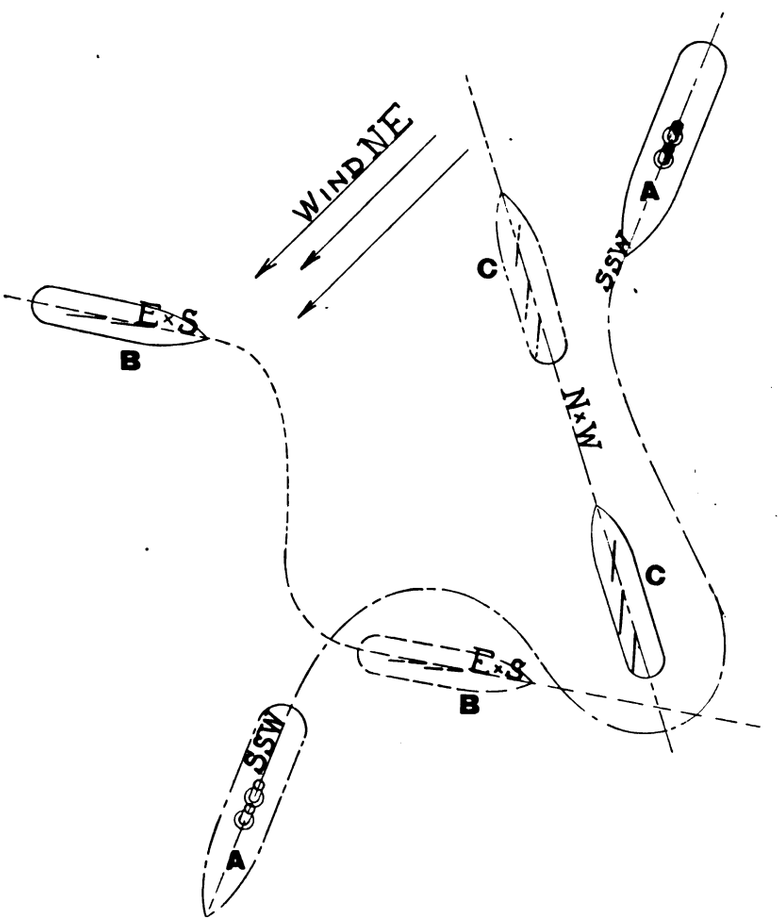
249. Keep your course and speed, the other fellow must port and go astern of you.

250. Hold my course; the schooner on my starboard bow is on the starboard tack steering about NNE, and has, therefore, crossed my course and is running away from me. The schooner on the port bow is on the port tack, steering about SSE, and has, therefore, crossed my course and is running away from me. See diagram following:



Wind East, steamer steering West; schooner on the starboard tack steering NNE, and schooner on the port tack steering SSE; steamer holds course; both schooners have crossed steamer's course.

251. The schooner on the starboard bow is on the port tack, crossing the steamer's course steering about ESE. The schooner on the port bow is on the starboard tack, crossing the steamer's course steering about NNW. You must starboard to go clear of the schooner on your port bow, and at the same time the schooner on the port tack must give way to the schooner on the starboard tack by putting her helm up. When the steamer gets by the schooner on the starboard tack, she must port in order to go astern of the schooner on the port tack, for the schooner on the port tack hauls up on her course again as soon as she has cleared the schooner on the starboard tack. The schooner on the port tack keeps her course throughout. The following diagram will illustrate this:



AA, steamer steering SSW; CC, schooner on the starboard tack steering N x W; BB, schooner on the port tack steering E x S. A, B, C, in the diagram showing continued lines, are the vessels in their first positions, or at the time of discovering one another. A, B, C, in the diagrams of broken lines, shows their positions after getting clear of one another. The dotted lines show the maneuvers necessary to clear one another.

252. By the tow's fog bell.

253. NE for starboard beam and SW for port beam.

254. Unfasten the painter from the stem and fasten one of its ends to one end of the oar and the other end of the painter to the other end of the oar and tow it astern. The oar dragging athwartships of your track will have the tendency to break the sea before it gets to you. Even the bight of a line towed in this manner will help to break the waves before they reach the stern. Oil can also be used to great advantage in cases of this kind.

255. Keep the yawl before the surf with the oars, merely steering with the oars with the inrush, and when the surf recedes give way hard on the oars so as not to lose ground. By doing this the surf will gradually carry the yawl to the beach.

256. A quantity of oil to smoothen the sea.

257. Cling to the yawl, it will eventually carry you ashore. Many a good swimmer has lost his life by trying to swing through the surf. It is the surf breaking over one's head that does the mischief.

QUESTIONS FOR MASTERS AND MATES.—NO. 50.

666. In a heavy sea towing another

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vessel you have a hawser that you cannot depend upon, what would you do to relieve the strain, you are pulling into the sea?

667. If the correct magnetic azimuth is N 134° E and the compass azimuth N 128° E, how much and which way is the deviation?

668. What is the principle of the pelorus?

669. How would you determine whether the strength in the ends of a magnet were equal?

670. If you were to use a magnet having unequal magnetic poles, what would the effect be?

671. How would you test a compass for sensitiveness, steadiness, magnetic power, etc.?

672. How would you determine whether the lubber points were correctly placed in the bowl?

673. How would you determine whether the compass needles were placed parallel with north and south on the compass card?

674. How would you determine that the divisions of the compass card were properly and equal divided?

675. Name the principal parts of a compass.

676. How would you put a compass in its gimbal ring?

677. What would you be particular about?

QUESTIONS ANSWERED.

Editor Question Department:—Will you kindly answer the following questions?

Respectfully,

A MATE SUBSCRIBER.

Ques.—How does a master legally take charge of a vessel?

Ans.—Takes the vessel's papers (license and enrollment) and goes before a customs officer and has his name endorsed on them in lieu of the last master. The master simply signs his name to a document which swears him in.

Ques.—What is a charter bond?

Ans.—Security furnished by the person chartering.

Ques.—How is the carrying capacity of life rafts figured?

Ans.—First determine the cubical contents of your tanks, or of each separate tank. If the tanks have square corners, simply multiply the length by the breadth and this product by the depth, not forgetting that each dimension must be expressed in the same denomination—that is, if one dimension is expressed in inches the other two dimensions must likewise be expressed in inches. If the tanks are cylindrical, then to find volume, first find the area of one end of the tank, by multiplying one-fourth of its diameter by its circumference, and then the length of the cylinder multiplied by the area equals volume, or cubical contents. Example:—A cylinder 8 in. in diameter and 3 ft. in length; what is its volume? To find the circumference of the cylinder multipy its diameter by 3.1416, thus $8 \times 3.1416 = 25.1328$ in. circumference; ¼ of 8 is 2 and 2 times circumference, $2 \times 25.1328 = 50.2656$ sq. in. area of end of cylinder, and this multiplied by the length of the cylinder, (3 ft.) 36 inches = 1808.5616 cu. in. = volume of tank. A water-tight compartment of any kind will float a weight equal to the weight of water it will hold or measure, less its own weight. In other words, it will displace a quantity of water equal to its own weight, and then its floating capacity will be equal to the weight of water it will measure less the weight of water displaced. A cubic foot (1,728 inches) of fresh water weighs about 62½ lbs., therefore, a tank containing a volume of 1,728 in. will buoy up a weight of 62½ lbs. less the weight of water it displaces. If a tank weighed 10 lbs. and had a volume of 2 cu. ft., the weight it would be capable of sustaining in water would be twice 62½ lbs. minus 10 lbs., or 115 lbs. This, of course, would submerge the tank to its entire depth. The government figures a weight of 156 lbs. to each person in the carrying capacity of life rafts, but the total buoyancy of each raft is subject to a statutory deduction. This is done as a matter of safety. For example, a raft having a tank 14 ft. by 6 ft. by 14 in. has a total buoyancy of 6,135 lbs., figuring that the buoyancy of the wooden work surrounding the tank was sufficient to counteract the weight of the tank, and it is safe in figuring it thus: 6,135 lbs. is equal to 39 persons at 156 lbs., but the government reduction allows this raft a carrying capacity of 36 persons.

Ques.—How is net tonnage figured?

Ans.—Net tonnage is gross tonnage minus the spaces occupied by the engines, boilers, chain lockers, etc., in the hold of a ship, figured in spaces of 100 cu. ft. A gross ton and a net ton occupy the same amount of space—that is, 100 cu. ft. The gross tonnage of a vessel is the entire cubical contents (figuring in the room occupied by the boilers, engines, etc.) of her hold below decks figured in spaces of 100 cu. ft., and the net tonnage is this same space with the engine and boiler rooms, etc., taken out. Net tonnage denotes all that space in the hold that is available for cargo. The net tonnage of a vessel does not represent her carrying capacity in tons, and neither does the gross tonnage, for, of the ordinary kinds of cargo every vessel will carry much more than her gross tonnage. Ordinary bulk freight measures about 40 cu. ft. to the ton, so that 2½ shipping tons would be equal to one marine or register ton. Package freight, such as boxes and bales, measures more to the ton and goes as high as 150 cu. ft., hence, a vessel would carry a less number of tons of this kind of freight than her net tonnage. Any freight that would occupy 100 cu. ft. to the ton, a ship could carry as much of it in her hold as her net tonnage measured. The marine or register ton of 100 cu. ft. is for vessel taxation, and other purposes, such as tonnage duty, dry docking, classification, etc. To ascertain the approximate gross tonnage of a vessel, take her mean or average length, her average width and her average depth of hold and multiply them together and divide by 100. For example: Supposing a vessel has an overall length of 400 ft., beam 50 ft. and depth 20 ft. Say the average length (the same width all the way through) is 370 ft., beam 50 ft. (averaging the length allows for the average beam) and 18 ft. average depth; hence, $370 \times 50 \times 18 = 333{,}000$ cu. ft. and this divided by 100 equals 3,300 gross tons. To get the net tonnage figure up the spaces occupied by boilers and engines, etc., by the same method and deduct it from the gross tonnage. While the above is only an approximation, it nevertheless, gives a very clear explanation of the methods practiced by ship builders and others in determining tonnage. The carrying capacity of a vessel is measured by the amount of water displaced, between when light and loaded, each 32 cu. ft. immersed being equal to one short ton, or every ton of water displaced equals 32 cu. ft.

The board of inquiry in the case of the battleship Kentucky on Lambert Point, Hampton Roads, in its report submitted to the navy department Oct. 25, completely exonerates Capt. Barry, the commander of the vessel, from any blame, the accident being shown to be due to the crowded condition of the roadstead. There were several colliers anchored at the scene at the time and as this is not an infrequent condition, and has been proved to be a menace to the safety of the battleships and other vessels, it is expected that the navy department will consider the adoption of more rigid regulations covering the subject of anchorage.

The Canadian Pacific Railway Co.'s steamship Empress of China sank at her dock at Portland, Ore., last week, her seacocks having been opened in manner unknown to the owners. She was booked to sail today for the Orient, but after being pumped out she will of course be delayed by the necessary repairs.

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THE THEORY AND PRACTICE OF LAKE NAVIGATION

BY CLARENCE E. LONG

METHOD BY APPROXIMATION.

In steaming along the land one can get the distance of a light or object ahead near enough by simply noting some land object marked on the chart, when it comes abeam. For this purpose you need no bearing instrument of any kind. Draw on the chart a line at right angles to the true course steered that will pass through the object on shore. The vessel is then situated somewhere on this line, or was at the time the bearing was taken; but how far from the object is the next question. You can guess this distance close enough, or by the height of the eye above the water and the height of the object. Whatever the distance you determine on prick this off on the bearing line drawn at right angles to the course and find the ship's position. All that is required then is to measure from the vessel's position to the light, or other object, that you desire to pass at a certain distance and pick it out of the tables as explained. Could there be anything more simple than this? We think not.

EITHER NAUTICAL OR STATUTE MILES.

Note.—Do not get the idea that the data contained in the foregoing tables is for nautical miles only, and that to make it correspond to statute miles, the latter have to be turned into knots. This has nothing to do with it at all. The theory of it is that triangles that are equiangular are similar, and if they are similar the corresponding sides must be proportional; in other words, if you have a triangle of a certain size, and you construct another triangle either inside or outside of it, having the same angles their corresponding sides will be proportional, because triangles which are equiangular are similar. Here is another way of explaining it:

BOAT MAKING NAUTICAL MILES.

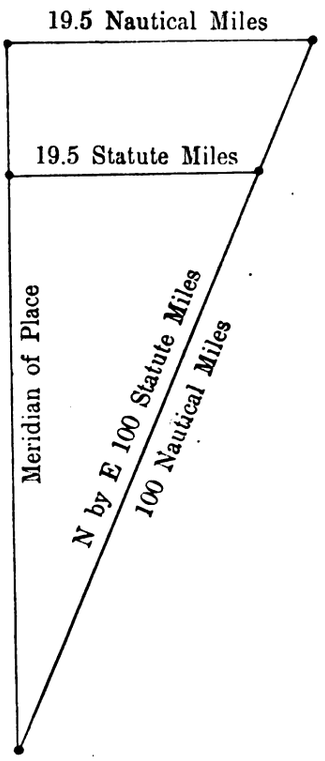
A boat starts from a certain place, and steers N by E for 100 nautical miles, at the end of her run how far will she be from the meridian passing through the place she started from? Answer. She will be 19.5 miles (nautical).

BOAT MAKING STATUTE MILES.

A second boat starts from the same place as the one above and steers N by E 100 statute miles, at the end of her run, how far will she be from the same meridian passing through the place started from? Answer. She will be 19.5 statute miles, or the same distance in statute miles that the other boat is in nautical miles; that is, both boats will be the same number, but in their own kind of miles, from the meridian.

DOES NOT LOOK IT, BUT IS SO.

This does not seem possible at first thought, but it is nevertheless a truth, for although the vessel making nautical miles sails a much greater distance than the one making statute miles she is leaving the meridian by the same proportion that the boat is that is making statute miles. The following diagram will better explain this.



Another good way to prove this is to lay it off on a chart:

Draw a N by E course having its starting point coincide at the intersection of some parallel and meridian. Lay off 100 statute miles (or a less number of miles will do) on the line representing the course and then draw another line (east and west) that will be at right angles to the meridian and that will pass through the ship's place at the end of her run. Measure the length of this line. Next prick off the same number of nautical miles as you have statute miles and lay it off on this course, and draw an east and west line and measure it as before, and if you work correctly you will find them to be the same number, but different kind of miles. The distance run represents the hypotenuse, the meridian the perpendicular, and the east and west line, the base.

The reason some men think the distance in a case of this kind corresponds only to nautical miles, is from the fact that these tables are employed in Traverse Sailing, where each mile (nautical) is equal to a minute of latitude. Of course, if you are sailing statute miles under these conditions you would first turn them into nautical miles.

THE REGULAR TABLES.

The regular Traverse Tables give distances up to 300 miles, and some of them to 600 miles. Where they are employed for dead-reckoning and the various sailings, this is necessary.

SQUARE ROOT.

The square root of a number is one of the two equal factors of that number.

Thus, 3 is the square root of 9, because 3 multiplied by 3 produces 9; 5 is the square root of 25.

Evolution is the process of finding the root of any power of a number.

The radical sign is $\sqrt{}$ when prefixed by a number, it indicates that some root of it is to be found.

The index of the root is a small figure placed above the radical sign to denote which root is to be found. When no index is written the index 2 is understood.[3]

To extract the square root of any number: Separate the expressions into groups of two figures each by placing a dot over the units' figure and over every alternate figure for the units, thus

. .

121, which is a perfect square, its root being 11, that is, $11 \times 11 = 121$.

2d. Take the largest square contained in the number expressed in the left-hand group out of that number and express its square root as the highest terms of the required root; with the remainder unite next term of the power for a dividend.

. .

Thus, in 121, the greatest square of 1 is 1, because $1 \times 1 = 1$; then bring down the 21 for a dividend. 3d. Multiply the terms of the root already found by 2, and add a cipher to it for a divisor, by which divide the dividend and express the quotient as the next term of the root. Thus, $2 \times 1 = 2$ and a cipher added makes 20 for a divisor. 4th. See how many times this divisor is contained in the remainder and add this number to the divisor.

(Having thus obtained the first two terms of the root, if there are other terms to be found.)

5th. Unite with the remainder the next term of the power for a new dividend. 6th. Multiply the terms of the root already found by 2, and apply the rule as in rule 3 and onward.

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Extracting the square root of 121, would stand thus:

```
  . .
121(11, the square of 121
 1
---
20 | 21
 1 | 21
-- --
 21
```

Find the square root of 625.

```
  . .
625(25, the square of 625
 4
---
40 | 225
 5 | 225
-- ---
 45
```

Find the square root of 4356.

```
  . .
4356(66, the square of 4356.
 36
---
120 | 756
  6 | 756
--- ---
 126
```

APPLICATION OF SQUARE ROOT.

A gardener having 1,024 strawberry plants set them in rows, putting as many plants in a row as he had rows; how many rows had he? Ans. 32 rows.

How many men must be placed in rank and in file that the largest square may be formed of 2,000 men, and how many men will be left out? Ans. 44 in rank and file each; 64 left out.

Note.—To square a number is to multiply it by itself, thus the square of 10 is 100. The square of 7 is 49.

OF RIGHT-ANGLED TRIANGLES.

A Triangle is a plane figure bounded by three sides, and having three angles.

A Right Angled Triangle is a triangle having one right angle, 90° or 8 points, or the angle forming a perfect square.

The Hypotenuse of a right-angled triangle is the side opposite the right angle, and is always the greatest side. The greatest angle is opposite the greatest side, and the greatest side is opposite the greatest angle.

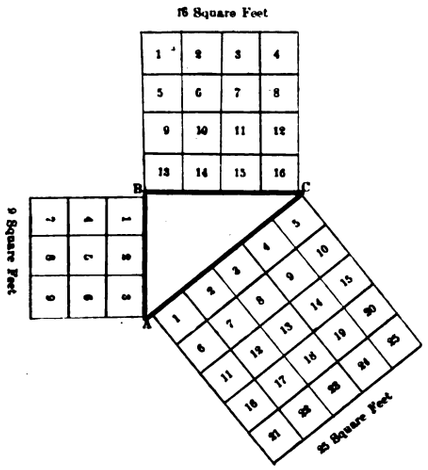
The Perpendicular of a right-angled triangle is the side which forms a right angle with the base.

The Base of a triangle, or of any plane figure, is the side on which it is supposed to stand.

The least angle is always opposite the least side and the next to the greatest side is opposite to the next greatest angle.

Suppose the figure ABC to be a right-angled triangle, whose hypotenuse is 5 ft., base 4 ft. and perpendicular 3 ft. A square formed on the hypotenuse AC will contain 25 sq. ft. (5×5); one formed upon the base BC, will contain 16 sq. ft. (4×4); and one formed upon the perpendicular, AB, will contain 9 sq. ft. (3×3).

Adding the squares AB and BC ($9 + 16$) we have for the sum 25 sq. ft.; therefore, the square on the hypotenuse, AC, is equal to the sum of the two squares upon AB and BC. It can be shown generally that the square upon the hypotenuse of any right-angled triangle equals the sum of the squares upon the other two sides.



In the accompanying diagram, 3 and 4 are two sides and the sum of these squares equals 25 ($3 \times 3 = 9$) and ($4 \times 4 = 16$) and $9 + 16 = 25$, and the square root of 25 is 5, the required side, which is the hypotenuse. Therefore, if the sum of the squares of perpendicular and base equals the square on the hypotenuse, the square of either the perpendicular or base subtracted from the square on the hypotenuse, will be equal to the square either of the base or perpendicular, as the case might be.

Rule I.—To find the hypotenuse, when the other two sides are given. Square the number of units in each of the two given sides, and extract the square root of the sum of these squares.

Rule II.—To find either of the two sides which form the right angle, when the hypotenuse and the other side are given: Square the number of units in the hypotenuse and the given side, and extract the square root of the difference of these squares.

What is the length of the hypotenuse of a right-angled triangle whose base is 12 rods and whose perpendicular is 9 rods? Ans. 15 rods.

```
 12      9
 12      9
 --      --
 24      81 = square on the perp.
 12
 --
144 = square on the base.
 81 = square on the perpendi
 ---
 . .
225(15 rods.
 1
 --
20 | 125
 5 | 125
-- ---
 25
```

If one side of a right-angled triangle is 6 rods long, and the hypotenuse 6½ rods long, what is the length of the other side?

```
 6 5      6
 6 5      6
 ---      -
  325     36 square on one side.
  390
  ---
 42.25 square on the hypotenuse.
 36
 ---
  6.25(2.5 rods.
  4
 ---
40 | 225
 5 | 225
-- ---
 45
```

A steamship and a sloop start from the same place at the same time, the former going east at the rate of 18½ miles an hour, and the latter going south at the rate of 4 miles an hour; how far apart are they at the end of 2 hours? Ans. 37.85 miles.

GEOMETRY BY CONSTRUCTION.

How angles are measured:

When the ends of two straight lines meet they form an angle. On the compass a line from the center drawn through North and from the center through NE forms an angle of 4 points, or 45°.

To measure angles with the Protractor: Place the center of the protractor at the juncture of the two lines to be measured. The meeting point of the two lines is really the center or vertex point, the lines forming the sides of the angle represent radiuses. Lay the line BC of the protractor along the line (the left line of the angle). This is the zero line of the protractor. Read the degree division at the circumference of the protractor where the other line forming the angle, coincides with it and this will be the required number of degrees of the angle.

The following illustration shows the protractor and its use in measuring angles. FAE forms an angle of 42°. A is the vertex of the angle, and the

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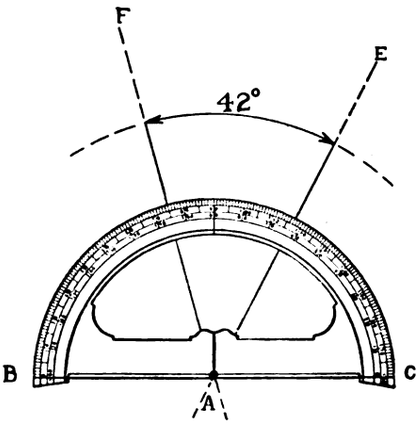
number of degrees as measured on the circumference between the two lines gives the angle. In the above case the center of the protractor is laid on the point A and let come where it will. The line AF coincides with the degree division of 75° and the line AE coincides with the division of 117°, their difference being 42°. Were the zero line of the protractor placed on the line FA EA would come on the 42d degree division of the circumference scale of the protractor.



Angles are plotted, or laid down, in the same manner. Make a dot to represent the vertex and place the notched center of the protractor over same. At the circumference of the protractor lay off the required angle by making a pencil dot at the required divisions. When this is finished draw lines from the vertex dot through each of the other dots and your angle lines are completed. If these angle lines are not long enough for the scale used, merely prolong them. The angle will remain the same. If the lines are too long, prick off the required lengths from your scale, and erase the rest.

Remember that the measure of an angle is the arc of the circle included between its sides. In the above diagram the arc between F and E (42°) measures the angle, the same as it does at the circumference of the protractor. The angle remains the same no matter how far the arc is from the vertex. There will always be the same number of degrees no matter what length the arc, the variation being in the space between the degrees. The angle at the center of a circle has the same number of degrees as the arc between the sides of the angle. See first part of arithmetic for further information on the protractor.

The protractor and a scale of equal parts can be employed in working some of the most difficult problems in higher mathematics. One has only to have an inkling of geometry to work problems in trigonometry. Adopt a scale of equal parts, say an inch to the mile. A rule divided to tenths would be handy for this purpose. Of course, it is to be understood that while this construction method is only approximate, the results are more than satisfactory for practical purposes.

Two angles and a side given to find the remaining angle and sides: Draw the given side the required length. Next lay off the angle at starting and draw the line, draw this line longer than it need be so that the third side in meeting it will pass through it. At the end of the first line lay off the 2d angle and draw the line. Measure the two sides from the points of intersection, using the same scale of equal parts. The 3d angle will be the sum of the other two subtracted from 180°. To prove the correctness of your work, measure this 3d angle. If this angle measures the same as the angle as found from adding the two and subtracting from 180°, your work is correct.

SHIP YARD NOTES.

The Pelly Dry Dock Co., Brooklyn, N. Y., has a steam lighter under construction.

I. L. Snow & Co., Rockland, Me., are having the frame for a 600-ton schooner cut in Nova Scotia.

Theo. A. Crane's Sons, Erie Basin, Brooklyn, N. Y., have recently launched two derrick barges and one covered barge.

The Weaver Ship Yard at Orange, Tex., launched the steamer Katharine recently, after considerably augmenting her size in their dry dock.

Smith & Rhuland, Lunenburg, Nova Scotia, launched the 100-ton schooner H. R. Silver, built for W. C. Smith & Co., of Lunenburg, early this month.

The Ellsworth Foundry & Machine Works, Portland, Me., has installed a marine railway capable of accommodating vessels up to 200 tons.

E. A. Wentworth, Rockport, Me., is in Virginia getting out the frame for a six-masted schooner to be built for William L. Palmer, of Boston, Mass.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., is repairing the army transport Kilpatrick and giving her a general overhaul.

The Neafie & Levy Ship & Engine Building Co., Philadelphia, Pa., has completed the tug Bern, built by them for the Philadelphia & Reading railroad.

Smith & Rhuland, Lunenburg, Nova Scotia, launched the three-masted schooner Mildred recently. She is 88 ft. on the keel, 27 ft. 4 in. beam and 11 ft. hold.

Wilson Bros. Astoria, Ore., launched the steamer Julia B., building for Capt. J. W. Babbidge, Nov. 12. She will be ready to go into commission in about a month.

The Tietjen & Lang Dry Dock Co., Hoboken, N. J., is rebuilding a covered barge owned by the Erie Railroad Co. as well as accomplishing repairs to numerous other craft.

Harry Sheppard, Essington, Pa., is constructing at his yard the largest gasoline yacht ever built on the Delaware. She is 125 ft. in length and will have an engine of 100 H. P.

The Union Works, San Francisco, Cal., has been awarded the contract for repairing the army transport Logan, the consideration being $259,452, the work to be completed in 120 days.

The Kelley-Spear Co., Bath, Me., has begun work on a 1,200-ton barge which it is to build for New York owners. This vessel will be 200 ft. in length, 35 ft. beam and 16 ft. deep.

The Neafie & Levy Ship & Engine Building Co., Philadelphia, Pa., recently launched the steel tug Adriatic. She is 84 ft. long, 20 ft. beam and 10½ ft. depth of hold and has a steel deck house.

The steamer Celtic, built at the Wallace Ship Yards, Vancouver, B. C., has been completed and left on her maiden voyage recently. She is owned by the Coast Steamship Co. and cost about $40,000.

The Weaver Ship Yard, Orange, Tex., has been awarded contract by the Hamburg American Steamship Co. for the construction of two more large barges, of the size of the two just completed for the same line at this yard.

The Spedden Ship Building Co., Baltimore, Md., has been awarded the contract for a general overhauling and repairing of the United Fruit Co.'s steamer Barnstable, which will be fitted out for her annual winter passenger service to the West Indies.

The Newport News Ship Building & Dry Dock Co. Newport News, Va., has laid the keels for two tugs which it is to build for the Lackawanna railroad. Work has also been begun on the derelict destroyer which is to be constructed for the revenue cutter service.

John H. Dialogue & Son, Camden, N. J., expect to have the tugs Hercules and Goliath, built by them for the Shipowners' & Merchants' Tugboat Co., San Francisco, ready to undertake the voyage to the Pacific shortly. The Hercules will tow the Goliath on the long trip.

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DETAILS OF THE NEW BRITISH STEAMSHIP COMBINE.

The full details of the proposed acquisition by the British firm of Furness, Withy & Co., Ltd., of the fleets of the British Maritime Trust and the Chesapeake & Ohio Steamship Co., Ltd., are made public in a circular issued to the stockholders of Furness, Withy & Co., Ltd., which reads as follows:

"The extraordinary general meeting, of which official notice is enclosed, is for the purpose of increasing the capital of your company, in order to acquire the fleets of steamers of the two associated companies, viz., the British Maritime Trust, Ltd., and the Chesapeake & Ohio Steamship Co., Ltd. With the acquisition of these fleets your company will become—including tonnage now building—the sole proprietors of 86 steamers, also possessing a controlling interest in 35 steamers, and partly owning 55 steamers, making a total of 176 vessels. We hold, besides, considerable investments in shipping companies owning and controlling large amounts of tonnage. Your company will then actually own in the aggregate 504,582 tons of steam shipping, exceeding in value £3,000,000 sterling. By the addition of these two fleets your company becomes the largest owners of exclusively owned British cargo steamers in the world. The earnings of the vessels now being acquired should augment the profits of your company by at least £150,000 per annum, to say nothing of the advantages of consolidation and consequent economies in general administration, together with the saving in insurance and working expenses, which my wide experience enables me to adequately appreciate. The company's organization and agencies in the United States of America, Canada, the colonies and on the continent, as well as in other important trading centers of the world, are on a scale that will enable us to fully utilize all the vessels under the company's flag and management. Although your company has recently built a number of steamers specially constructed for its coal trade, which has so enormously developed during the past few years, these have proved inadequate to the increasing requirements of this department of our business. Agreements have been entered into for the purchase of the two fleets, which comprise 39 fully-equipped modern steamers, the valuation of these having been made by Messrs. T. W. Tamplin & Co., of 83 Gracechurch street, London, E. C., at the purchase consideration of £1,605,900. The present capital of your company is £2,000,000, consisting of 1,200,000 ordinary shares of £1 each and 80,000 5 per cent cumulative preference shares at £10 each. There are no debentures, these having been paid off and cancelled. It is proposed to increase the capital to £3,500,000 by the creation of 860,000 additional shares of £1 each and 70,000 additional preference shares at £10 each, both ranking pari passu with the existing shares, thus making the total capital 2,000,000 ordinary shares of £1 each and 150,000 5 per cent cumulative preference shares of £10 each. It is, however, only proposed to issue 35,000 of the preference shares, the remaining 35,000 being reserved for future developments. I have already given it as my opinion that the ordinary shares are worth more than the price at which they were issued or today's quoted price. Consequently the issue of ordinary shares will be strictly confined to existing shareholders, and those shareholders to whom it may not be convenient to increase their holding will have their rights allotted to them so that they may be able to dispose of them for cash through their brokers should they desire to do so. The shares will be offered on such favorable terms and conditions as are only possible by limiting the allotment exclusively to shareholders and their transferees. It will thus be seen that the proceedings at the extraordinary general meeting are of purely formal character, being for the purpose of sanctioning the increase of capital, and after this has been confirmed at a subsequent meeting as required by the articles of association the directors will communicate to you the premium rights and conditions under which the shares will be offered. It is by such savings as are here indicated and by taking advantage of favorable opportunities of development that your company has been built up in the past, and it is in the direction of economical administration derived from concentration of management, and I know of no scheme of development which will tend to the future prosperity of your company in a more marked degree than the one now proposed."

ITEMS OF GENERAL INTEREST.

Since Sept. 1 the Harlan & Hollingsworth Corp., Wilmington, Del., builders of ships and railway cars, and in which Charles M. Schwab has the controlling interest, has discharged 1,800 workmen and now has only 400 employed in its plant.

The Red Star liner Finland, bound from New York to Antwerp, struck a breakwater while making the port of Dover this week and suffered extensive damage to her bows, the plates having been driven back for about 20 ft. and extending below the water line.

In a test of speed of the third torpedo boat flotilla, made over the measured mill course off Newport, R. I., recently, the Thornton is reported to have made a record of 24.17 knots. The next best record, 21.5 knots, was made by the Stringham. The other vessels participating in the test were the Shubrick, the Delong, and the Stockton.

Bids were opened Oct. 21 by the United States engineer at Louisville for the construction of two steel barges. The American Bridge Co. of New York was the lowest bidder at $7,050 each. The other bidders were: Blaw Collapsible Steel Centering Co., Pittsburg, Pa., $10,525 each; Howard Ship Yard Co., Jeffersonville, Ind., $8,950 each; Charles Heggewald Co. of New Albany, Ind., $8,999 each.

The Mexican government has recently granted a concession to the United States permitting of the maintenance of a naval coaling station in Magdalena Bay, Lower California, for the term of three years. The grant allows the navy to station two coaling ships in the bay and is made on condition that the United States make a like concession to the government of Mexico.

Commander Peary's arctic exploration ship Roosevelt was given a trial trip recently after having completed an overhauling at the Shooter Island ship yard, Shooter Island, N. Y. She has been fitted with new boilers, a new bottom, new interior fixtures and new quarters for her crew, and is now ready for her next journey northward, which is scheduled to begin about the first of May, 1908.

An explosion of the boilers of the German schoolship Blucher, which occurred Nov. 6 at Kiel, resulted in the loss of the lives of 15 of the men and the serius injury of 30 of them. The Blucher is a torpedo schoolship and was built at Kiel in 1877. Three hundred of the crew were fortunately absent from the vessel at the time of the accident, being engaged in maneuvers with the tenders.

In his annual report Secretary of the Navy Metcalf will recommend the construction of two new dry docks, one of which he would have built at Mare Island navy yard and the other on the Atlantic coast, either at the Brooklyn navy yard or at Newport. It is possible that the selection of the location for the latter dock may be left to congress although the secretary may recommend Newport as a location for it.

The U. S. collier Abarenda sailed from Norfolk with coal for the Atlantic fleet, recently, she having aboard 150 tons of briquettes made

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at the government testing plant for fuels at the Jamestown Exposition grounds. It is claimed that the efficiency of the coal is increased 15 per cent through the process and that the briquettes are practically smokeless. They will be tested on the battleship Connecticut.

The new turbine steamer Od Colony, of the Fall River line, and which is the first vessel of that type to be built on the Delaware river, successfully completed her standardization runs Nov. 17. Her maximum speeed was 21 knots, or two and one-half knots more than her contract calls for. She was built by the William Cramp & Sons Ship & Engine Building Co., Philadelphia, and is 400 ft. long, 52 ft. beam and 14½ ft. draught.

The contract of George B. Spearin for the construction of a concrete dry dock at the Brooklyn navy yard has been declared forfeited by the secretary of the navy. About a year ago work on the dock was abandoned and it has never been resumed, the contractor having given several reasons for non-performance, including the assertion that contact with an intersecting sewer, not shown in the plans, had been encountered, as well as damage by storms and increased price of material.

Capt. George Milsom has just returned to Buffalo from the Jamestown exposition where he attended a series of experiments at the United States geological survey fuel loading plant to determine the relative fuel value of certain fuel products. Capt. Milsom, who is an enthusiastic exponent of motor boat sport, states that the experiments showed that it takes 1½ gallons of denatured alcohol to produce as much power as a gallon of gasoline, although alcohol costs about twice as much as the gasoline. The experiments were carried on for about six weeks, he said.

As a result of the trial which has been conducted at about 20 of the 200 life saving stations maintained by the government on the coasts and on the great lakes, in which the utility of motor-propelled life boats has been under observation, it is announced that in the immediate future all of the stations will be equipped with such boats and that from time to time the number of motor boats at each station will be increased until the time shall have arrived when oars will have ceased to be a means of saving life, except in cases of emergency.

It is the purpose of Furness, Withy & Co., one of the foremost of England's great shipping firms, to enter into a combination with other interests by which it would acquire the British Maritime Trust and the Chesapeake & Ohio Steamship Co. with their fleets, thus becoming the owner of no less than 504,582 tons of steam shipping, all of which represents cargo steamers and would be the greatest combination of this class of tonnage in existence. In order to accomplish this purpose it is proposed to increase the capital of Furness, Withy & Co. from $6,400,000 to $17,500,000.

Rear-Admiral Henry Ware Lyon was placed on the retired list on Nov. 8. He was born in Massachusetts and was graduated from the naval academy a Annapolis in 1866. His first sea duty was on the Sacramento, which was lost off the coast of India in 1867. Admiral Lyon commanded the gunboat Dolphin in the Spanish-American war, being attached to the North Atlantic squadron. In 1901 he was assigned to the command of the cruiser Olympia of the Asiatic fleet and of late had been commandant of Mare Island navy yard.

The New England Steamship Co., which is the marine department of the New York, New Haven & Hartford Railroad Co., is to begin Jan. 1, the operation of three of its steamers, the Bunker Hill, Old Colony and Massachusetts, in a steamship service between New York and Boston at rates about 25 per cent less than those in force at present. No attempt will be made to operate the steamers at great speed and the service will at first be tri-weekly, a daily schedule to be inaugurated if business warrants. The arrangement is the result of conferences held by Boston merchants with the railroad company.

The turbine steamship Creole, built by the Fore River Ship Building Co., Quincy, Mass., for the Southern Pacific railroad, and which failed to meet her requirements in her first trial from New York to New Orleans, has been given a rearrangement of her machinery and will be subjected to a builder's trial on Saturday over the government measured mile course off Provincetown. On her former trial the Creole attained her contract speed of 16.7 knots, but failed to maintain the required average of 16 knots on 6½ tons of coal per hour on the round trip from New York to New Orleans.

Secretary of the Navy Metcalf recently made public his estimate of the amount which will be necessary for the naval service for the fiscal year beginning July 1, 1908, as $125,031,399. For the present fiscal year the last congress appropriated $100,303,602, which was about $20,000,000 less than the estimates for the next fiscal year. The increase over this year's estimates are reported to be $5,000,000 for the pay of the navy, due mainly to an increase in the number of enlisted men; $9,000,000 for ordnance and ornance stores, and $9,000,000 for public works at the various navy yards and naval stations.

When the German Reichstag assembles Nov. 22 one of the most important measures to be submitted to it will be a bill modifying the naval program of 1900. The naval proposals, it appears are in two parts, the first of which reduces the service term of naval vessels from 25 to 20 years, the second increasing the size of battleships and great cruisers to the standards adopted in other navies, for instance the Dreadnought or other later types. It is estimated that the new scheme will require $15,000,000 more per year than the German government has heretofore expended on its navy, and including the projected submarines and auxiliary vessels, $17,500,000 more per year.

Allis-Chalmers Co., of Milwaukee, has been awarded the gold medal for electric generators and motors, issued by the authorities of the Jamestown Exposition, as determined by a jury of well-known technical experts representing leading electrical interests of the country. A second gold medal has also been granted for the good judgment and taste shown in the design and erection of the exhibit, which has been one of the most attractive features of "Machinery Hall." Gold medals have previously been taken by electrical apparatus of this company's build at the Louisiana Purchase Exposition, Paris Exposition and other exhibitions where there was international competition.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., is making preparations for the laying of the keel of the 20,000-ton battleship Delaware, as well as for the laying of the keels of a suction dredge for the Columbia river, two dredges and six steel dump scows for the Isthmian canal commission, a revenue cutter and a revenue cutter tug.

The New England Co., Bath, Me., will have the four-masted schooner Bertha L. Downes ready for launching about the last of the year and will immediately start upon the construction of a duplicate of her.

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BIDS FOR REPAIRING LIGHT TENDER.

Bids received at the office of the inspector of the fifth lighthouse district, Baltimore, Md., and opened Oct. 25, for making repairs to the light tender Violet, were as follows:

	Repairs.	Yellow sheathing per sheet
*James Clark Co., Baltimore, Md.	$2,270.00	$1.60
Spedden Ship Building Co., Baltimore, Md.	2,277.73	2.35
Chesapeake Marine Railway Co., Baltimore, Md.	2,332.00	2.40
Booz Bros., Baltimore, Md.	2,338.00	1.87
McIntyre & Henderson, Baltimore, Md.	2,435.00	2.40
Skinner Ship Building & Dry Dock Co., Baltimore, Md.	2,455.00	1.65
Marine Railway, Machine & Boiler Wks., Baltimore, Md	3,226.89	2.32

*Contract awarded.

James R. Michael, 280 Broadway, New York $5,160.00
Old Dominion Paper Co., Norfolk, Va. 5,270.00
Thomas M. Turner, 86 Worth St., New York 5,134.00

Class 84—Brooklyn—5,000 Yds. Cotton Canvas and 500 Lbs. Cotton Twine.

Otto Goetze, 109 Worth St., New York $1,832.50
John H. Meyer Co., 75 Worth St., New York 1,778.75
Old Dominion Paper Co., Norfolk, Va. 2,459.50

Class 85 Brooklyn—3,000 Lbs. Flax Twine.

Joseph F. Curran, 56 Leonard St., New York $1,098.00
Richard W. Geldart, 2 Stone St., New York 990.00
Old Dominion Paper Co., Norfolk, Va. 986.67
F. P. Wilkinson, 1 Hudson St., New York 969.00

Class 86—Boston—18,000 Lbs. Flax Twine.

Old Dominion Paper Co., Norfolk, Va. $5,894.76

BIDS FOR CONSTRUCTION OF PIER AT CHARLESTON, S. C.

Bids received at the bureau of yards and docks, navy department, Washington, D. C., opened Nov. 16, for the construction of a reinforced concrete and wooden pile and timber deck pier at the U. S. navy yard, Charleston, S. C., were as follows:

	Pier complete, 650 ft. long, Government Specifications.	Pier complete, 570 ft. long, Government Specifications.	Pier complete, 650 ft. long, Bidders' Specifications.	Pier complete, 570 ft. long, Bidders' Specifications.
Grant Wilkins, 23½ Whitehall St., Atlanta, Ga.	$153,000	$134,000	$123,000	$ 96,000
Alsop & Pierce, 138 Twenty-eighth St., Newport News, Va.	123,000	108,500	98,905	87,358
Simons-Mayrant Co., 16 Broad St., Charleston, S.C.	139,367	124,014	108,661	99,367
Raymond Concrete Pile Co., 140 Cedar St., New York	.....	.....	139,875	129,968
New York Continental Jewel Filtration Co., 15 Broad St., New York	139,840	124,890	89,885	.....
A. F. Chapman & Co., 20 Breckinridge St., Buffalo, N. Y.	103,400	93,800	80,000	79,400
Bernard Rolf, 39 Cortlandt St., New York	109,330	96,333	.....	.....
William L. Miller, 19 Milk St., Boston, Mass.	99,900	90,000	79,600	78,430
General Contracting & Engineering Co., 15 Whitehall St., New York	.....	.....	73,630	64,840

BIDS FOR NAVAL SUPPLIES.

Bids received at the bureau of supplies and accounts, navy department, Washington, D. C., for materials and supplies for the navy yards, opened Nov. 19, contained the following:

Class 22—Mare Island—About 20,000 Lbs. Cable Chain.

Baker & Hamilton, 900 Third St., San Francisco, Cal. ..... $ 924.10
Dunham, Carrigan & Hayden Co., San Francisco, Cal. 1,002.28
Richard H. Grey, 1777 Tenth Ave., East Oakland, Cal. 1,021.50
Hayden-Corbett Chain Co., 250 Fulton St., New York 938.02
J. B. Kendall, Washington, D. C. 1,029.15
Lebanon Chain Works, Lebanon, Pa. *901.57
Manning, Maxwell & Moore, 85 Liberty St., New York 1,434.40
New Jersey Foundry & Machine Co., 9 Murray St., New York 1,257.08
Charles S. Robidoux, St. Louis, Mo. 1,059.52
Vermilye & Power, 17 Battery Pl., New York 1,067.85
Excelsior Equipment Co., Frick Bldg., Pittsburg, Pa. 1,019.03

Class 46—Mare Island—Metallic Packing.

Garlock Packing Co., 136 Liberty St., New York $1,350.04
H. W. Johns-Manville Co., 100 William St., New York 1,619.84

Class 49—Mare Island—Two Brass Gate Valves.

Chapman Valve Mfg. Co., Indian Orchard, Mass. ..... $ 956.00
Lunkenheimer Co., Cincinnati, O. 1,200.00
Excelsior Equipment Co., Frick Bldg., Pittsburg, Pa. 1,304.50

Class 53 Norfolk—122-Ton Trolley Hoists.

Brown Hoisting Machinery Co., 26 Cortlandt St., New York $1,920.00
Manhattan Supply Co., 127 Franklin St., New York 1,608.00
Vermilye & Power, 17 Battery Pl., New York 828.00

Class 82—Boston—100 Tons Manila Hemp.

John D. Baumann & Co., 118 Maiden Lane, New York $31,091.00
MacLeod & Co., 82 Beaver St., New York 33,040.00
Edward D. Verplank, 126 State St., Boston, Mass. 32,480.00

Class 83—Brooklyn 20,000 Yds. Cotton Ravens and 6,000 Yds. Cotton Canvas.

Smith & Dove Mfg. Co., Andover, Mass. 5,934.60
F. P. Wilkinson, 1 Hudson St., New York 5,724.00

Class 91—Brooklyn—2,500 Ft. Unlined Linen Fire Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass. ..... $ 800.00
S. F. Hayward & Co., 20 Warren St., New York 697.50
Manning, Maxwell & Moore, 85 Liberty St., New York 662.50
Motley, Green & Co., 66 Broad St., New York 725.00
William G. Stevenson, 110 Race St., Philadelphia, Pa. 675.00

Class 113—Brooklyn—16,500 Lbs. Black Iron Chain.

F. S. Banks & Co., 73 Warren St., New York $1,012.47
H. E. Boucher Mfg. Co., 91 Maiden Lane, New York 1,072.26
Richard W. Geldart, 2 Stone St., New York 644.18
Hayden-Corbett Chain Co., 250 Fulton St., New York 816.70
J. B. Kendall, Washington, D. C. 1,010.16
Lebanon Chain Works, Lebanon, Pa. 993.60
Manning, Maxwell & Moore, 85 Liberty St., New York 1,086.40
Motley, Green & Co., 66 Broad St., New York $890.92, $990.28 857.80
New Jersey Foundry & Machine Co., 9 Murray St., New York 942.26
Ole K. Olsen, 901 Carondelet St., New Orleans, La. 1,202.25
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md. 1,068.12
Excelsior Equipment Co., Frick Bldg., Pittsburg, Pa. 1,076.40

Class 136—Brooklyn—1,000 Ft. Steam Hose for Fire Room.

Boston Belting Co., 256 Devonshire St., Boston, Mass. ..... $ 650.00
Double Service Packing Co., 430 Walnut St., Philadelphia, Pa. 695.00
S. R. Fletcher & Co., 26 Cortlandt St., New York 650.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York 690.00
Mallinson & Grossman, 23 Warren St., New York 670.00
Sprague Electric Co., 527 E. 34th St., New York 415.00

BIDS FOR DREDGING DELAWARE RIVER.

Bids received by Major J. C. Sanford, corps of engineers, U. S. army, Philadelphia, Pa., for dredging in sections 4 and 5 of the Delaware river, opened Nov. 15, were as follows:

P. Sanford Ross, Inc., Jersey City, N. J. $409,864.00
Morris & Cummings Dredging Co., New York 481,398.40
American Dredging Co., Philadelphia, Pa. 351,232.00

BIDS FOR REPAIRING EMBANKMENT.

Bids received by R. R. Jones, chief assistant engineer, for Lieut. Col. William T. Rossell, corps of engineers, U. S. army, Cincinnati, O., opened Nov. 12, for repairing and protecting Great Miami embankment at Lawrenceburg, Ind., were as follows:

John W. Scott, Aurora, Ind., and George P. Walker, Cincinnati, O. ..$19,172.00
Thomas J. McKim, Lawrenceburg, Ind. 15,478.00
Albert T. Gridley, Aurora, Ind., and William J. Abraham, Lawrenceburg, Ind. 26,266.00
The L. Eid Concrete Steel Co., Cincinnati, O. 27,399.00

DREDGING AND CONSTRUCTION WORK.

Contract for dredging and constructing jetties in the James River, Virginia, has been awarded by Major Spencer Cosby to P. Sanford Rose Incorporated, Jersey City, N. J., upon his bid of $197,114.10. The other bidders were the Coastwise Dredging Co., Norfolk, Va., $214,543.90, and the Norfolk Dredging Co., of Norfolk, Va., $204,315.90.

Bids were recently opened by Col. J. H. Willard, government engineer, Newport, R. I., for dredging Long Bed, Providence Harbor, to a mean depth of 25 ft. at low water. Following were the bidders: R. G. Packard Co., New York, 43 cents per cubic yard; J. S. Packard Dredging Co. and Charles M. Cole, Providence, R. I., 28 cents; Morris & Cummings dredging Co., New York, 26 2-11 cents; International Contracting Co., New York, 24 cents; Columbia Dredging Co., New York, 22 cents; Maritime Dredging Co., New York, 61 cents; John A. Seeley, New York, 48 cents, and Atlantic Dredging Co., New York, 29 cents. Contracts are awarded to the Columbia Dredging Co., lowest bidder. About $90,000 is involved.

The Northwestern Marine Co., Seattle, Wash., has closed contract with Pinich & Martinolich, Tacoma, Wash., for the construction of a new fishing schooner for the halibut trade to be 102 ft. in length, 22 ft. beam, and to be fitted with twin-screw gas engines of 65 H. P. each. The vessel, which is to be schooner rigged, will carry a crew of about 25 men and will be equipped with 10 dories.

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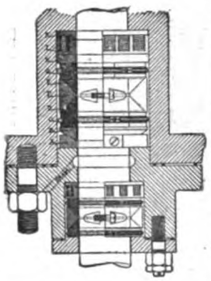

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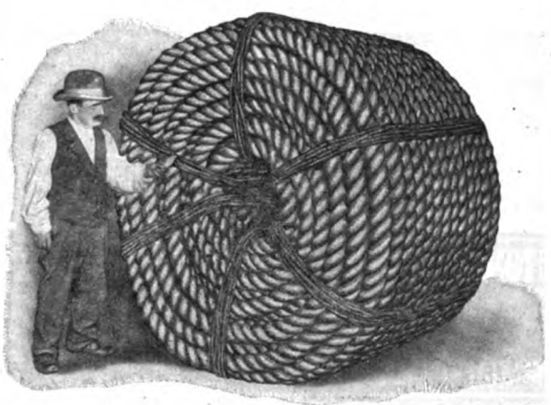

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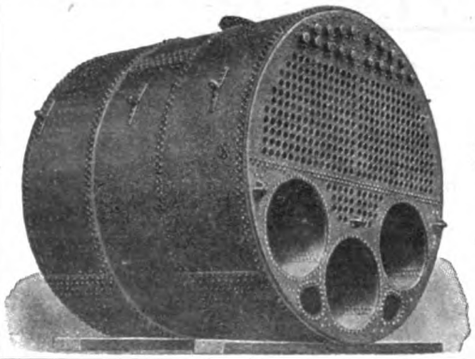

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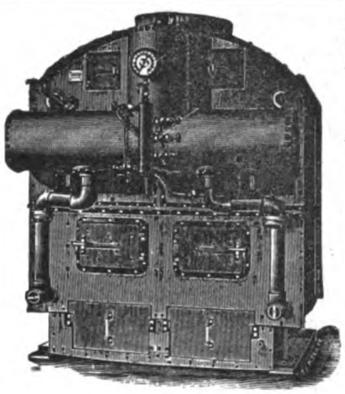

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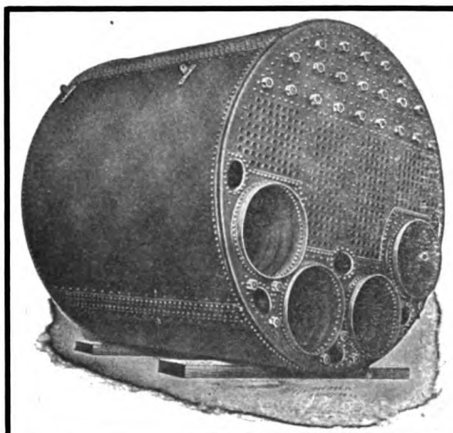

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